FINAL
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Technical Requirements

For
Environmental Laboratory Analytical Services

BP Laboratory Management Program (LaMP)

Issued By:

Atlantic Richfield Company- a BP- affiliated company

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1.0 INTRODUCTION

Atlantic Richfield Company, a BP-affiliated company, (hereafter "BP") procures the services of commercial environmental laboratories to generate and report high quality data that identifies and defines the physical and chemical characteristics of soils/sediments, solid waste, wastewater, air, surface water and groundwater for environmental investigations, remediation activities, long-term monitoring programs, discharge compliance monitoring, and waste characterization. Sample matrices submitted to the laboratory for waste characterization may include liquids, solids, air, biota and semi-solids. The analytical methods requested for BP projects will be under the purview of Resource Conservation and Recovery Act (RCRA); Clean Water Act (CWA); Clean Air Act (CAA); Comprehensive Environmental Response, Compensation & Liability Act (CERCLA); Toxic Substance Control Act (TSCA); non-regulatory based, voluntary investigations; and National Pollutant Discharge Elimination System (NPDES) permit compliance. These data will serve as the basis for evaluating characteristic conditions, for selecting possible environmental technologies, for assessing permit compliance and for assessing environmental quality. As such, the analytical data must be accurately and precisely generated and reported in conformance with the applicable method, "best industry standards" and the technical requirements stated herein. These Technical Requirements provided herein shall be considered requirements under the terms of the Laboratory Master Services Agreement (LMSA).

1.1 QUALITY CONTROL

1.1.1 **Improper, Unethical, or Illegal Actions - Policies, Training, and Procedures**

The laboratory shall have a process/procedure in place for educating and training personnel in their ethical and legal responsibilities including the potential punishments and penalties for improper, unethical, or illegal actions. The training must be up to date, documented and evidence must also be on file, which demonstrates that each employee has read, acknowledged, and understood their personal ethical and legal responsibilities including the potential punishments and penalties for improper, unethical, or illegal actions. The laboratory must have the necessary software in place to prevent or minimize the use of inappropriate or unethical techniques or procedures in generating data.

Ethics training must occur prior to employees handling BP samples, including reporting of results. Refresher ethics training must occur annually for all employees handling BP samples, including reporting of results.

1.1.2 **Quality System**

The laboratory shall establish and maintain a quality system based on the required elements contained in this section and appropriate to the type, range, and volume of environmental testing activities it undertakes.

a) The elements of this quality system shall be documented in the organization's quality manual.

b) The quality documentation shall be available for use by the laboratory personnel.

c) The laboratory shall define and document its policies and objectives for, and its commitment to, accepted laboratory practices and quality of testing services.

d) The laboratory management shall ensure that these policies and objectives are communicated to, understood, and implemented by all laboratory personnel concerned.

e) The quality manual shall be maintained current under the responsibility of the quality assurance officer.

f) The QA officer shall perform, at a minimum, annual internal audits of all analyses being performed for BP. The internal audit must include an evaluation of computer systems/electronic data, as well as evaluations of logbook reviews, and standard reagent labeling and traceability. In addition, the internal audits must include a written report, written corrective action, and documented corrective action follow-up to ensure implementation and effectiveness of the corrective action.

1.1.3 **Quality Manual**

The quality manual, and related quality documentation, shall state the laboratory's policies and operational procedures established in order to meet the requirements of this section.

The quality manual shall list on the title page: a document title; the laboratory's full name and address; the name, address, and telephone number of individual(s) responsible for the laboratory; the name of the quality assurance officer (however named); the identification of all major organizational units which are to be covered by the quality manual and the effective date of the version.

The quality manual and related quality documentation shall also contain:

a) a quality policy statement, including objectives and commitments, by top management;

b) the organization and management structure of the laboratory, and its place in any parent organization's relevant organizational charts;

c) the relationship between management, technical operations, support services and the quality system;

d) procedures to ensure that all records are retained, as well as procedures for control and maintenance of documentation through a document control system which ensures that all standard operating procedures, manuals, or documents clearly indicate the time period during which the procedure or document was in force;

e) job descriptions of key staff and reference to the job descriptions of other staff;

f) identification of the laboratory's approved signatories; at a minimum, the title page of the Quality Manual must have the signed and dated concurrence, (with appropriate titles) of all responsible parties including the QA officer(s), technical director(s), and the agent who is in charge of all laboratory activities such as the laboratory director or laboratory manager;

g) the laboratory's procedures for achieving traceability of measurements;

h) a list of all test methods under which the laboratory performs its testing;

i) mechanisms for ensuring that the laboratory reviews all new work to ensure that it has the appropriate facilities and resources before commencing such work;

j) reference to the calibration and/or verification test procedures used;

k) procedures for handling submitted samples;

l) reference to the major equipment and reference measurement standards used as well as the facilities and services used by the laboratory in conducting tests;

m) reference to procedures for calibration, verification, and maintenance of equipment;
n) reference to verification practices including inter-laboratory comparisons, proficiency testing programs, use of reference materials, and internal quality control schemes;

o) procedures to be followed for feedback and corrective action whenever testing discrepancies are detected, or departures from documented policies and procedures occur;

p) the laboratory management arrangements for permitting departures from documented policies and procedures, or from standard specifications;

q) procedures for dealing with complaints;

r) procedures for protecting confidentiality (including national security concerns), and proprietary rights;

s) procedures for audits, data review, and corrective action

t) processes/procedures for establishing that personnel are adequately experienced in the duties they are expected to carry out and are receiving any needed training;

u) processes/procedures for educating and training personnel in their ethical and legal responsibilities including the potential punishments and penalties for improper, unethical, or illegal actions;

v) reference to procedures for reporting analytical results; and,

w) a Table of Contents and applicable lists of references and glossaries, and appendices.

1.1.4 General Requirements for Laboratory Staff

The laboratory shall have sufficient personnel with the necessary education, training, technical knowledge, and experience for their assigned functions.

All personnel shall be responsible for complying with all quality assurance/quality control requirements that pertain to his/her organizational/technical function. Each technical staff member must have a combination of experience and education to adequately demonstrate a specific knowledge of their particular function and a general knowledge of laboratory operations, test methods, quality assurance/quality control procedures, and records management.

The laboratory management shall be responsible for:

a) Defining the minimal level of qualification, experience, and skills necessary for all positions in the laboratory. In addition to education and/or experience, basic laboratory skills such as using a balance, colony counting, aseptic or quantitative techniques shall be considered.

b) Ensuring that all technical laboratory staff has demonstrated capability in the activities for which they are responsible.

c) Ensuring that the training of each member of the technical staff is kept up-to-date (on-going) by:

(1) Providing and maintaining documentation attesting that each employee has read, understood, and is using the latest version of the laboratory's in-house quality documentation which relates to his/her job responsibilities.

(2) Providing training courses or workshops on specific equipment, analytical techniques or laboratory procedures. All training shall be documented.

(3) Requiring successful performance of initial and on-going documentation of competency (DOC) as defined in the latest version of the National Environmental Laboratory Accreditation (NELAC) Standard. Documentation of the DOC must include acceptance criteria and documented supervisory review and approval.

(4) Providing training and documentation attesting that each employee has read, understood, and will comply with this document.

(5) If exams or quizzes are used for assessing comprehension, the exams/quizzes must be graded/scored and pass/fail criteria established.

d) Documenting all analytical and operational activities of the laboratory.

e) Supervising all personnel employed by the laboratory.

f) Maintaining all employee-training files. Files must include a resume, hire date, a current position description, and a summary listing of all methods for which the analyst is trained and

competent to perform. Files must be highly organized to enable effective evaluation during audits and must undergo a documented annual review for completeness and accuracy.

g) Ensuring that laboratory Health and Safety plans comply with BP Health and Safety requirements as detailed on the BP website, http://rmhsse.bpglobal.com/.

h) Ensuring that all standard operating procedures (SOPs) undergo a documented review and/or revision at a minimum of every 2 years or when the laboratory procedure changes, whichever occurs sooner.

i) Ensuring that all original copies and electronic copies of SOPs, Quality Manual, hard copies of BP data packages, electronic copies of BP data packages, and all associated hard copy and electronic data associated with the preparation, analysis, and reporting of BP samples (*i.e.*, standards preparation logbooks, balance calibration logbooks, *etc.*) are stored in a manner that provides redundancy of copy and protection from catastrophic loss (such as fire).

j) Ensuring that only the current approved SOPs are in use; the use of draft versions of SOPs, hand-annotated or otherwise is not acceptable. All outdated or retired SOPs must be removed from service when the new SOP is issued or the procedure is eliminated. All SOPs or work instructions must be controlled documents.

k) Maintaining a centralized quality system for the issuance, tracking, and archiving of all logbooks and notebooks used during the receipt, preparation, storage, analysis, and reporting of BP samples. In addition, all logbooks or notebooks must undergo a documented supervisory or peer review on a monthly basis. Any work sheets or forms that are not initially part of a bound logbook or notebook must be archived in a bound form.

l. Ensuring that all analytical instrumentation used for BP sample analysis has an associated controlled maintenance logbook. Logbooks will designate the associated instrument by name, serial number, and the date of start-up. All routine preventative and/or corrective action maintenance must be documented (corresponding analysis logbook as well) in the associated logbook. Each instrument maintenance logbook should be included in the centralized quality system mentioned above.

m) Ensuring that all electronic deliverables (*i.e.*, Excel® spreadsheet, PDF, *etc.*) are error free and in parity with the hard copy deliverables, including but not limited to significant figures.

n) Facilitating the correction and re-issue of any hard copy or electronic deliverables that have identified errors in an acceptable timeframe.

o) Supplying adequate storage for BP samples.

p) Minimizing laboratory contamination of BP samples including but not limited to posting cleaning SOPs at cleaning stations, appropriate storage of cleaning equipment (hanging cleaning brushes between uses), and solvent/acid rinsing of preparation equipment prior to use.

q) Ensuring the security of BP samples during receipt, storage, preparation, analysis and reporting. The laboratory must be able to definitively identify and document each employee who is involved in the receipt, preparation, analysis, and reporting of BP samples.

2.0 SCOPE OF WORK

The scope of work (hereinafter referred to as "Services" or "Work") for chemistries, analyses, or methods, the turnaround time, and the required analytical methodology, and/or test groups dictating specific analyses and required analytical methodology will be set forth using specific, agreed upon Chain-of-Custody (COC) forms (Table 1). All BP samples should be submitted for analysis with the most recent revision of the BP COC. The COC will comprise a valid Work Release under the terms of the Laboratory Master Services Agreement (LMSA).

The BP LMSA will provide for BP's right to designate an authorized third party (representative, environmental consultant) to act as BP's representative under the agreement. If so authorized and directed by BP, the third party will release work under the agreement by executing the proper forms and procedures, receive/review and approve invoices, and in some instances pay invoices on behalf of BP. In such instances, BP remains ultimately responsible and accountable under the terms of the agreement, including payment of any moneys due the laboratory under the terms of the agreement. All terms of the agreement, including pricing, will remain the same as if BP directly released the work.

2.1 SERVICES PROVIDED

The laboratory shall provide the necessary labor, materials, and equipment [including all certified, clean sample containers/vessels, high-purity preservatives, packaging, and

other materials (Chain-of-Custody, custody seals, temperature blanks, pH paper, *etc.*)] to analyze soil/sediment, surface water, wastewater, air, groundwater, and storm water, biota and waste samples.

Sample containers must be virgin bottle ware, equivalent to I-CHEM™ Series 300 unless written approval to use other containers is provided by the appropriate BP personnel or designated representatives. All sample containers must be certified clean at or below the requested reporting limit for all requested target analytes. For air analyses, special cleaning and certification requirements exist; cleaning and certification of Summa® canisters is detailed in Appendix A.

The laboratory is required to supply trip blanks in association with all volatile organic analyses (including GRO and VPH). The laboratory will supply three 40-mL vials filled completely with deionized water for aqueous samples (no headspace). The laboratory will supply three 40-mL vials filled with 10 mL of deionized water and a stir bar for solid samples. In the event trip blanks are not received with samples submitted for the volatile organic analyses, the laboratory must notify the BP designated contractor or the Laboratory Management Program (LaMP) Manager (by phone and/or e-mail) and comment on the issue in the Case Narrative.

The lot numbers of bottle ware and preservatives submitted by the laboratory must be traceable through laboratory generated bottle ware request documentation. However, drop shipments of bottle ware to BP or their designated representatives, need not be traced by the laboratory. Laboratories shall provide an adequate amount (as determined by BP, or their designated representative) of traceable (the preparation of all prepared preservations must be documented through laboratory logbooks) high-purity preservatives on an as needed basis, without additional charge. Laboratories will be responsible for the cleanliness and purity of bottle ware and preservatives. Unless otherwise specifically directed, all aqueous volatile organic compound (VOC) samples must be preserved with hydrochloric acid. However, laboratories should not assume that received acid/base preserved aqueous samples have been properly preserved. All acid/base preserved samples must have pH measured upon receipt (except for aqueous volatile samples, which must be performed at the time of analysis) and the actual measurements documented. Solid samples submitted for volatile organic analyses must be prepared and analyzed in accordance with Appendix B.

If the laboratory determines that the pH of an aqueous sample submitted for metals analysis is >2 and adds chemical preservative to identified samples, the samples must be allowed to equilibrate for 16 hours after the addition of the preservative. After this equilibration period, the sample pH must be checked for acceptability prior to preparation and analysis of the sample.

No charges will be assessed for purchase and routine shipment of materials to BP via standard UPS or other drop shipment carrier.

All sample containers shipped to BP (or their contractors on their behalf) must be shipped under Chain-of-Custody and must be under a custody seal. The laboratory is responsible for maintaining traceability records (*i.e.*, lot number of sample containers and other materials) for all shipments. The laboratory is required to supply sufficient numbers of sample containers to satisfy all method criteria, collection of field QC samples (triple volume for MS/MSD or MS/Duplicate), and corrective actions (*i.e.*, two 1-liter amber glass containers for semivolatile organic water samples, three EnCore® samplers and a 4-ounce glass jar for each volatile organic sample). It is part of the laboratory's responsibility to educate BP's contractors as to the need to have adequate sample volume for all samples. Notification (by phone or e-mail and Case Narrative documentation) of the lack of sufficient sample volume/weight for any requested analysis will also be required.

Although there are plans for standardization, BP does not currently have a standardized electronic data deliverable (EDD) format. However, project specific formats such as the ENFOS deliverable format, the California COELT deliverable or the EarthSoft Equis deliverable format or an EDD of similar complexity will be required. The laboratory must have the personnel with the appropriate information technology expertise to develop and implement a variety of EDDs as requested on a project-specific basis. Project EDDs are to be included at no additional cost to BP.

EDDs will be expected to be error-free. In the event one is not, the laboratory will revise and reissue an error free EDD at no additional cost to BP. BP may request that contracted laboratories provide EDDs in a specific format at any time during the life of the contract. BP may request that all EDDs be uploaded (error-free) into a data base of BP's choosing at any time during the life of the contract.

The laboratory must maintain method detection limit (MDL) studies for all methods and analytes determined for BP samples. The MDL studies must meet the criteria defined in 40CFR Part 136 Appendix B or the current USEPA promulgated definition of MDL studies. The MDL study should be performed annually for each sample preparation and analysis-method pair by instrument (*i.e.*, sonication/SW-846 Method 8270C on instrument 7). At a minimum, the MDL study must be performed on a single instrument and the calculated MDL must be confirmed through the analysis of a calculated MDL standard (concentration of the calculated MDL standard MUST BE AT the calculated MDL value AND undergo any applicable sample preparation [*i.e.*, sonication extraction]) on all instruments used to analyze BP samples. For the MDL standard to be acceptable, all target compounds must be recovered on all instruments.

2.2 ANALYTICAL PROCEDURES

The majority of work will involve laboratory analysis of soils/sediments, wastewater, air, surface water, groundwater, and biota and waste samples. In addition to the technical requirements stated herein, all work must be performed in full accordance with the specifically requested SW-846 analytical methods, USEPA analytical methods, Standard

Methods for the Examination of Water and Waste Waters and any other published methodology, including all applicable acceptance criteria and corrective actions. Deliverables must conform to the data package deliverables provided in Appendix C and any additional project-specific deliverables, which may be requested. Laboratories must possess all necessary certifications (*i.e.*, drinking water, waste water, solid waste, *etc.*) and be capable of analyzing samples by US EPA 100-600 methods, SW-846, US EPA600/4-79-020, US EPA600/4-88-039, US EPA600/4-89-017, US EPA CLP SOW, US EPA Toxic Organics methods, and methods specified in 40 CFR Part 136, as appropriate in accordance with the requests of BP (or consultants acting on BP's behalf). Laboratories must immediately contact the BP LaMP Program Manager in the event of a potential or actual decertification event.

BP has the following requirements for sample preparations in addition to the published preparation methods:

a. Semivolatile organic compounds (base, neutral, acid, and PCBs) in solid samples must be extracted using a 1:1 mixture of methylene chloride and acetone, unless the method specifically mandates use of a single solvent extraction.

b. For volatile organic solids, the surrogate and MS solutions must be added to all medium-level (methanol) samples prior to the addition of methanol to the sample.

c. For volatile organic solids, the laboratory must prepare an LCS at the time of sample preparation for all medium-level (methanol) extractions.

d. For volatile organic solids, all volatile analysis sample preparations must be made from the EnCore® sampler or tared vials. When EnCore® samplers or tared vials are submitted to the laboratory, use of bulk containers for volatile preparation and analysis is not acceptable (see Appendix B for further information).

2.3 QUALITY CONTROL ANALYSES (GENERAL)

For the purposes of a definition, a "batch" shall be considered up to 20 samples of the same matrix and the same extraction/digestion/preparation type and preparation event (up to 8 hours). The laboratory will prepare matrix spikes (MS) and matrix spike duplicates (MSD) for organics with every batch containing BP samples. The laboratory will prepare MS and MSD or MS and laboratory duplicate (DUP) for inorganics and general chemistries with every batch containing BP samples. For each extraction/digestion/preparation event, only one laboratory control sample (LCS) and one method blank shall be prepared. The use of multiple method blanks within an extraction/digestion/preparation event is strictly prohibited, with the exception of volatile organics (See Section 3.1.5.2). The use of an LCS duplicate (LCSD) is permissible, however, both the LCS and LCSD must pass criteria and must be reported.

Unless project-specific QC is required, if 10 or fewer BP samples for a project are submitted for analysis, the laboratory will be allowed to use and report a non-BP sample, or "Batch QC," for the MS/MSD analyses. If 11 or more BP samples for a project are submitted for an analysis, the laboratory must use a BP sample for the MS/MSD analyses. BP may elect to specify that a BP sample be used for the MS/MSD analyses if 10 or fewer samples are submitted for an analysis; ***in this instance, the MS/MSD sample analyses are billable units***. Samples identified as trip or field blanks cannot be used for the MS/MSD analysis. Although the preparation of LCSD are permitted, in these cases, the laboratory will be required to perform corrective actions (*viz.,* re-preparation/reanalysis) if any requested target analyte is outside the acceptance criterion in either the LCS or LCSD. ***In addition, one sample analysis, regardless of the mandatory re-extraction/reanalysis, dilutions, etc., will be considered one billable unit.***

If BP (or its consultants acting on its behalf) indicates that trip blanks are to be held and not analyzed, the holding, storage, and disposal of these trip blanks are not billable.

Section 3.1 of this document provides more detail concerning quality assurance (QA)/QC analyses.

2.4 LIMITATIONS ON SUBCONTRACT AND NETWORK LABORATORIES

BP (and its consultants acting on its behalf) will authorize, audit, and approve only specific laboratory facilities for use in the BP LaMP. LaMP authorized, audited, and approved laboratories are defined as “Network Laboratories.” A LaMP laboratory is not allowed to transfer any work to a non-network laboratory, even if such non-network laboratory is owned by or affiliated with the supplier, without the prior written approval of BP as detailed below.

If a laboratory is unable to perform all of the analyses within the appropriate holding times, or if the laboratory is not certified for the specific parameter or does not have a valid developed method (inclusive of a valid MDL study) in place, BP (or its consultants acting on its behalf) must immediately be notified. Subcontracting or allocating work to non-network laboratories will be allowed only with prior written consent of the BP LaMP Manager or his designated alternate. E-mail or web-based notification and approval is acceptable and recommended. Documentation of such approval must be appropriately filed and available during any audit proceedings. On a semiannual basis, each laboratory must provide a listing of the subcontract laboratories that are used to analyze BP samples to the BP LaMP Manager. The listing must include the subcontract laboratory name, location, the type of analysis, and the total dollar value unless such information has already been entered into the LaMP laboratory central website.

2.5 COMPLIANCE WITH GOVERNMENTAL AGENCIES

Work performed under this contract must be in compliance with all current or applicable Federal/State/Local requirements. Requirements stated in these contractual technical requirements are not intended to supersede Federal/State/Local requirements, and in cases where there is a conflict between the requirements stated herein, the LaMP Program Manager (or his designated alternate) must be notified for specific clarification and direction on resolving the conflict. Notwithstanding the foregoing, LaMP laboratories shall maintain adherence to any quality assurance project plan, permit requirement, consent order or any other site-specific order mandated by any state or regulatory body. In addition, with regard to any sample containers, sample, or materials shipments, LaMP laboratories must be in full compliance with all applicable state and US Department of Transportation (DOT) regulations. In this regard, at least one laboratory employee must undergo formal DOT training.

2.6 DISPOSAL OF SAMPLES

The laboratory shall retain all excess sample(s) for a minimum of three weeks following the associated report submission, unless BP personnel request a longer retention time in writing. ***Unless otherwise directed in writing by BP, laboratories will be responsible, and will assume all liability, for proper characterization and disposal of samples and bottle ware.*** Laboratories shall comply with all Federal/State/Local regulations concerning the proper management, storage, shipment, and treatment/disposal of all wastes, residual samples, and empty bottleware generated as a result of the analysis of BP samples. BP requires laboratories to fully and completely remove all labels, or totally disintegrate glass and plastic bottle ware disposed wastes, residual samples, and empty bottle ware, prior to disposal. The use of recycling firms for recycling glass and plastic bottleware is an option but approval (in writing) must be granted by the BP LaMP Manager. BP requires that adherence to these requirements and final sample disposition be completely documented and managed by LaMP laboratories, inclusive of any samples submitted to subcontract laboratories by the LaMP laboratories.

a. The laboratory employee responsible for waste disposal manifesting must have successfully completed formal DOT and hazardous-waste handling training.

b. The laboratory must acquire and use appropriate waste-collection/storage containers with secondary containment for use as satellite collection points.

c. All waste-storage areas must be controlled and under limited access.

d. The laboratory must have a frequently purged disposal system for samples that will preclude the excess holding time or accumulation of samples that have already been analyzed.

e. All non-hazardous waste must be disposed of at a state-permitted RCRA Subtitle D facility.

f. All hazardous waste must either be treated or disposed of at a RCRA Subtitle C permitted facility.

g. All PCB-contaminated waste must be either treated or disposed of at a TSCA-permitted facility.

h. Hazardous and PCB waste shipments must be shipped in accordance with DOT hazardous materials regulations and manifested with appropriate land disposal restriction documentation requirements in accordance with the applicable RCRA and/or TSCA regulations.

Upon reasonable notice, laboratories shall submit to health-and-safety and waste-management audits to be conducted by BP personnel or by BP authorized representatives throughout the duration of any contract period (See Section 3.2.3).

All LaMP laboratories shall maintain and adhere to a current Health and Safety Plan and/or Chemical Hygiene Plan, inclusive of a full description of health and safety practices, which fully and completely complies with all applicable state and federal regulations. In addition, LaMP laboratories shall place a high priority on exercising "best practices" with regard to personnel health and safety (for example, but not limited to, immediately removing from use all broken, chipped, or jagged-edge glassware from the laboratory workplace, conducting documented fire extinguisher training, performing/documenting quarterly fume hood velocity checks, performing air balance studies, and performing hazard assessments).

2.7 REVIEW OF PROJECTS

Prior to reporting results to BP (or its consultants acting on its behalf), **ALL** data must undergo a thorough supervisory or peer review by an authorized secondary person who was not responsible for the generation of the data to be reviewed. The data review must include, but is not limited to, confirmation of analyte qualitative identification, quantitative accuracy, and an evaluation to determine if the criteria defined in the laboratory SOPs and this document have been met.

LaMP laboratories will be responsible for timely responses to inquiries from BP and its authorized representatives regarding LaMP work for the purposes of project reviews. These inquiries include, but are not limited to, responses to performance evaluation test results, corrective action reports based on on-site audits, and requests for information regarding or clarifications identified during data validation by BP consultants. In the event of conflicting requests from consultants, the laboratory will seek clarification and direction from the LaMP Manager

LaMP laboratories will be required to actively participate in the BP self-improvement reporting (SIR) process. LaMP laboratories will be required to institute corrective action

based on the SIR process feedback and will be requested to provide feedback on the BP's authorized representatives to the extent that the feedback affects effective laboratory processes.

From time to time, the LaMP Manager will require a LaMP Laboratory representative to attend periodic LaMP meetings to exchange ideas, review past performance and gain consensus on future activities. In the past, these meetings have been conducted semiannually and it is not anticipated that the meeting will be more frequent than have been in the past. The cost associated with attending the LaMP meetings will be borne by the LaMP Laboratories.

2.8 RESAMPLING/REANALYSIS OF SAMPLES

In the event that re-sampling or reanalysis is required due to laboratory error, laboratory inappropriate technical judgment, equipment malfunction, or omission in the specified analytical procedure, testing requirements, technical requirements stated herein, or exceeded sample holding times (preparative and/or analytical), ***the laboratories will be required to bear the cost resulting from re-sampling and reanalysis (labor and expenses), in accordance with the established contract terms***. ***LaMP laboratories will not be permitted to place any restrictions of any kind on these re-sampling/reanalysis efforts, including but not limited to the selection of the contractor performing the re-sampling or the LaMP laboratory performing the reanalysis. All such re-sampling and reanalysis events must be registered on the LaMP website or with the LaMP Manager.***

2.9 COMMUNICATIONS WITH BP

Each LaMP laboratory must designate one BP LaMP Manager to act as the primary laboratory contact responsible for timely identification and resolution of any and all issues, including contract and administrative issues, and to serve as the LaMP laboratory's representative on the LaMP extended team. The contact information for these designated individuals must be registered on the LaMP website and maintained to be correct.

Each LaMP laboratory facility must also designate a Technical Project Manager and an alternate. This individual (or alternate) will be responsible for initiating frequent communications with appropriate BP personnel or the designated representative during project activities that involve sampling and analysis.

Any phone calls initiated by BP personnel, or its designated representatives to the LaMP laboratory must be returned in a timely manner (within 4 hours) on a normal business day if the Technical Project Manager (or alternate) is not available at the initiation of the phone call.

In all cases where LaMP laboratory corrective action is warranted, the corrective action must include a determination of root cause, documented training, and in person documented verification by laboratory QA personnel that the implemented corrective action was completely successful prior to closure. Corrective action documentation will be reviewed during each annual audit.

It is the Technical Project Managers responsibility to communicate ***any*** problems observed during sample receipt, preparations, analysis, or reporting to appropriate BP personnel, or its designated representative, verbally and either by fax transmission or e-mail within 24 hours (preferably three hours, beginning with the normal business day immediately following for problems noted during second shifts or weekends) after discovery. For example, problems may include but are not limited to: inappropriate sample containers, broken bottles, errors or ambiguities in paperwork, insufficient sample volume/weight, inappropriate pH [all acid/base preserved samples must have pH measured (for aqueous volatiles at the time of analysis) and the actual measurements documented], elevated temperature, and/or project reporting limits that will not be met due to sample dilution or other analytical limitation.

2.10 TIMELY DELIVERY OF RESULTS - TURN AROUND TIME (TAT)

Many of BP's projects require quick responses to inquiries and timely delivery of analytical results to BP or its designated representative. The standard turn-around for delivery of verified, laboratory-verified results for this LaMP contract is, in general, 14 calendar days. Turn-around time shall be measured from the date and time a sample with an acceptable COC is *received* (*viz.*, the date/time the sample is physically delivered to the LaMP laboratory or picked up by laboratory courier, which is not necessarily the time logged in at the LaMP laboratory), to the date/time the final analytical report is received by BP or their designated representative. For "24-hour TAT" samples, any samples received prior to 3 PM must be reported prior to 5 PM the next calendar day. Verified receipt of mailed, faxed or electronically transmitted final results will meet this requirement. ***In the event there will be additional charges for priority or expedited service, LaMP laboratories will be permitted to charge additional costs (via the multiplier) for expedited service at the stipulated BP LMSA fees.***

3.0 ANALYTICAL SCOPE OF WORK

3.1 ANALYTICAL REQUIREMENTS

Samples submitted to LaMP laboratories will be analyzed for parameters utilizing a variety of regulatory-approved preparatory and analytical methods, as directed in writing by BP facility personnel or designated representative. In the case of waste characterization using SW-846 methods, LaMP laboratories are required to be in full

compliance with these mandated method-defined requirements (*e.g.*, SW-846 Method 1311, 1312, and Chapter 7). LaMP laboratories are required to be knowledgeable in all state-specific requirements applicable for samples accepted for analysis from BP or its representatives. It is the responsibility of the LaMP laboratories to immediately notify the responsible BP personnel or its representatives in situations where a specific state certification is necessary to perform the requested analyses and the receiving LaMP laboratory does not possess said certification.

Not withstanding the multi-solvent extraction requirement specified, and project specific requests to the contrary, any promulgated extraction and/or digestion procedure is acceptable (as validated through the LaMP laboratory, inclusive of a valid MDL study), as long as the laboratory can demonstrate acceptable sample preparation procedures through the use of blank spikes or standard reference materials (*viz.*, LCSs) and as long as sample clean-up procedures are performed as necessary. For some specific parameters and/or media, BP may require one or more specific sample clean-up procedures. Even when not specifically requested, the laboratory must exercise "best practices" judgment in applying appropriate extract clean-ups that will enhance the quality of the analytical data and result in the lowest possible reporting limits.

When performing solid sample metals digestions, either Teflon® chips, glass beads, or a purchased certified solid LCS (*e.g.*, NIST River sediment, etc.) can be used; however, in all cases the laboratory must perform the entire solid sample digestion procedure on the LCS.

3.1.1 For BP samples submitted that do not meet the project-specified reporting limits, LaMP laboratories must make available upon request compelling documentation (*e.g.*, screening data) and a justifiable explanation for its inability to meet the specified limits and must provide an explanation with the analytical report/data package (*i.e.*, dilution factor, interference, etc.). Excessive, unnecessary dilutions on any samples for a project will ***not*** be acceptable and may result in re-extractions/reanalysis at the laboratory's expense. In the event multiple extractions/analyses are performed (*e.g.*, undiluted and diluted analyses), resulting in several data sets for the same sample, the laboratory will be required to select the best individual results from the multiple analyses and report one single set of data representing the least diluted, most QC compliant results unless otherwise directed on a project-specific basis. Table 2 (Multi-analysis/Extraction Flow Chart) provides guidance to be used by the LaMP laboratories in determining the "best of" results to report. In situations where BP Full data packages are requested, the raw data and QC results for all multiple dilution analyses must be included in the deliverable. The need for the reporting of results between the instrument detection limits/method detection limits (IDL's/MDL's) and the reporting/quantitation limits will be specified by BP on a project-specific basis. Where project specific limits are not specified, the LaMP laboratories must have a consistent reporting policy between their quantitation/reporting limits and the corresponding MDL's for the requested target analytes.

Unless otherwise directed in writing on a project-specific basis, LaMP laboratories shall not report sample results in which analytes are detected at reportable concentrations in both the sample and the associated blank(s), or which are analyzed beyond acceptable holding time without BP or its authorized representative being contacted prior to LaMP laboratories reporting said data.

When a sample requires a dilution analysis, the laboratory is responsible to report the results for not detected analytes from the most concentrated or lowest dilution analysis (*e.g.*, sample analyzed at a five-fold and 10-fold dilutions should have all not detected analytes reported from the five-fold dilution analysis). In order for a sample dilution analysis to be acceptable, the on-instrument concentration of the highest target analyte must be in the upper half of the calibration curve. If the highest concentration of a target analyte is not in the upper half of the calibration curve, a more concentrated analysis must be performed.

Appendix B provides direction for the preparation and analysis of solid volatile samples. Solid volatiles samples for BP must be appropriately preserved or analyzed within 48 hours of collection. The laboratory must confirm with BP and its consultants acting on its behalf what reporting limits are required to ensure appropriate preservation and analysis of the solid volatile sample occurs.

3.1.2 Unless state-specific holding times are shorter, the BP required preparatory and analytical holding times will be those that appear in the most current SW-846, 40 CFR Part 136, USEPA CLP SOWs and all other regulatory-approved methods.

Holding times begin at the date/time the sample is collected as documented on the Chain-of-Custody. The samples should be in good condition and will be received by the laboratories generally within one calendar day of sampling, unless different arrangements are made in advance with the laboratory's authorized representative. For shipments to be received by the laboratory after normal business hours (Monday-Friday, 0800 to 1700 hours), prior arrangements will be made so that laboratory personnel are available to receive the samples. Further, for those same samples for which prior arrangements were not made, each laboratory should make every reasonable effort to meet the specified holding times but will not be held responsible for costs incurred should re-sampling be necessary.

The required holding times must be adhered to for the initial sample preparation/analysis, subject to the limitations specified above. In the event subsequent reanalysis or re-extraction ***become necessary due to method requirements or additional requirements stated herein***, the laboratory must make every effort to meet the primary holding times. If re-sampling should be necessary, the laboratory will not be held responsible for costs incurred.

In the event, however, that the laboratory otherwise fails to adhere to the stated holding times for the initial sample preparation/analysis for samples received during normal business hours, and it becomes necessary to resample, then ***the costs of re-sampling (labor and expenses) and reanalysis will be borne by the laboratory subject to all provisions stated in Section 2.8.***

3.1.3 The integrity of the samples delivered to the laboratory should be maintained through proper handling/storage procedures and preparation/analysis within holding times. The date and time of sample receipt shall mean the date and time the laboratory signs the receipt from the courier or shipping company. Each laboratory must maintain documentation of the performance of these sample handling/storage and preparation/analytical procedures and an internal Chain-of-Custody. Samples requiring temperature preservation should not be allowed to reach a temperature >6^{o}C during sample receipt/log-in procedures prior to being placed in laboratory cold storage.

Regarding the receipt of samples, it is critical that BP samples that are received at ≤6 ^{o}C be maintained at the temperature during the laboratory log-in process. Periodic and final additional temperature measurements to ensure proper temperature is being maintained beyond 20 minutes of safe removal from coolers are required. If an IR thermometer is being used, the laboratory must take the sample temperature from the sample label or have correction factors established for all sample container types. The use of a temperature blank is not required if an IR thermometer is used exclusively. Similarly, LaMP laboratories must maintain documentation that their cold storage facilities are being maintained at ≤6^{o}C but not frozen through daily (at a minimum) documented temperature measurements. In all cases, for temperature measurement associated with sample receipt and storage (samples, reagents, reference materials, etc.), the laboratory shall perform documented temperature measurements using a calibrated thermometer or other appropriate temperature measurement device with measurement resolution of 0.5^{o}C or less (*i.e.*, 0.1 ^{o}C).

Properly labeled (*e.g.*, date installed, cold storage unit number) storage blanks must be initiated and analyzed on a bi-weekly basis for each cold storage unit (refrigerator and freezer) used to store BP samples submitted for the analysis for volatile organics including GRO and VPH. Any field and/or trip blanks submitted by BP must be stored in the same cold storage units as the samples that they are intended to be associated with (even if the matrices are different). The laboratory shall maintain detailed records regarding the analysis of storage blanks. The laboratory must generate and maintain acceptance criteria and must have a documented contingency/corrective action plan in the event a storage blank yields a positive result above the laboratory's acceptance criteria.

Unless otherwise directed in writing on a project specific basis, with the exception of soil samples submitted for the analysis for volatile organics (including GRO and VPH), all other submitted solid samples must undergo a

documented thorough sample homogenization (*e.g.,* formal cone and quartering) using inert utensils/mixing platforms that will not interfere with the target analytes being requested for analysis. The preferential homogenization of the solid MS/MSD sample is not acceptable.

3.1.4 All quantitative apparatus used as part of sample preparation, including but not limited to: thermometers, sonicators, micropipettes, syringes (>20µl), auto-dispensers, balances, and weights must undergo frequent, documented calibration/tuning checks inclusive of an acceptance criterion and documented corrective action (*i.e.*, NELAC frequency suggestions). All volumetric glassware must be Class A. All thermometers and thermocouples must undergo annual (at a minimum) calibration checks against an NIST reference thermometer; each thermometer must subsequently be labeled with a unique number, date of calibration, and the correction factor (should be 0.0° if no correction factor is to be applied). Logbooks must indicate the thermometer identification and indicate when a thermometer is replaced. All recorded temperature measurements must include the uncorrected and corrected temperature.

Organic extracts must be stored in the same type of vials (amber or clear) as the associated standards at the appropriate storage temperatures.

All sample preparation (organic, inorganic, wet chemistry, and biological) must be fully documented and inclusive of sample preparation conditions (*e.g.*, digestion temperatures, blow-down temperatures) and documentation allowing complete traceability to all prepared or purchased reagents, acids/solvents, filter lot numbers and prepared or purchased reference solutions.

All solvents, acids, preservatives and reagents must be verified for purity prior to being used to prepare BP samples. All spike solutions and calibration standards must be used prior to labeled expiration dates (and/or manufactured expiration dates, whichever is shorter) and stored in accordance with manufacturers recommended conditions. Complete and unequivocal documentation (*e.g.*, logbooks, databases, and Certificates of Analysis) must exist to enable traceability of all prepared spike solutions, calibration standards and prepared reagents back to the reference/salt materials utilized, including acid and solvent lot numbers. All organic extractable spike solutions must undergo documented verification (*e.g.*, concentration and direct injection) **prior** to being used to prepare BP samples. An acceptance criterion of 80-120% (or better) is required for all target analytes for this direct-injection verification. Verification records must be maintained in an orderly fashion and readily retrievable during on-site audits.

3.1.5 All QC procedures employed by LaMP laboratories will be in full accordance with those described in the required analytical methods with additional requirements stated in these technical requirements. LaMP laboratories will, upon request, provide all data and information to demonstrate that the analytical system was

properly calibrated at the time of analysis, including the calibration method, frequency, source of standards, concentration of standards, response factors, linear range, check standards, and all control limits. General QC protocols for analyses will be required as follows:

a. For all initial multi-concentration calibration curves, the lowest concentration must be less than or equal to the laboratory's reporting limits. For linear or quadratic curve equations, the laboratory shall not force the curve equation through zero. The laboratory shall not use the origin (0,0) for a point in a calibration curve, unless empirically determined. The criteria identified in SW-846 Method 8000C must be used to evaluate linear or quadratic curve equations.

b. For analyses in which surrogate compounds and/or internal standard compounds are used, all analyses (samples, instrument blanks, clean-up blanks, calibration standards, *etc.*) must include the surrogate and/or internal standard compounds.

c. Reanalysis of a labeled trip, field, equipment, or rinsate blank for a reason other than QC failure or clearly demonstrated instrument carryover is not permitted.

d. Surrogate compound recoveries and/or internal standard areas must be evaluated for all instrument or clean-up blanks.

e. Samples must be re-prepared and analyzed to confirm matrix interference if any one (reportable or not) or more high surrogate recovery is observed and at least one positive result for a target compound is observed. Samples must be re-prepared and analyzed to confirm matrix interference if any one (reportable or not) or more low surrogate recovery is observed. Re-injection of the same initial extract for extractable organics with a repeated failure will not constitute an acceptable complete corrective action.

f. For all organic analyses that utilize an internal standard, the laboratory must evaluate the internal standard area and retention time for all samples, standards, and QC samples. If the methodology does not include acceptance criteria for internal standards, the internal standard area of a sample or QC sample must be within 50% to 200% of the associated CCV standard. The retention time (RT) for the internal standard of a sample or QC sample must not vary from the RT of the associated CCV standard by more than ±10 seconds. Samples must be reanalyzed to confirm matrix interference if one or more internal standard area is outside of the acceptance criteria.

g. For all organic analyses that utilize an internal standard and the methodology does not specify acceptance criteria for the CCV, the internal standard area

in a CCV must be within 50% to 200% of the internal standard area of the internal standard in the associated midpoint initial calibration standard. The RT for the internal standard of a CCV must not vary from the RT of the associated midpoint initial calibration standard by more than ±10 seconds. It the internal standard acceptance criteria are not met for a CCV, the CCV may be repeated once. If the internal standard acceptance criteria are not met in the two CCV standards, corrective action is to be taken and the system must undergo a new multi-point calibration after appropriate maintenance (if any).

h. For inorganic analyses that utilize a internal standard, the laboratory must evaluate the internal standard response for all samples and QC samples. If the methodology does not specify acceptance criteria, the internal standard response of a sample(s) and the QC sample(s) must be within 60% to 140% of the associated CCV standard. Samples must be reanalyzed to confirm matrix interference if the internal standard response is outside of the acceptance criterion.

i. The laboratory must store all reference materials according to the manufacturer's specified conditions.

j. All standards, solutions, reagents, and other consumables must be labeled including, but not limited to, the date of receipt, the date opened, the expiration date, the concentration of components, and lot number.

k. Frequent designated purge cycles should be established to remove expired materials and standards from production areas. For the use of expired reference materials for research purposes, those expired reference materials must be totally removed from laboratory preparatory and analytical areas.

l. Sample preparation and analysis efforts must include recorded documentation within the preparation worksheets/logbooks and the injection/analysis logbooks to allow for the complete traceability of all reference materials, prepared or purchased, and other materials (*i.e.*, lot number of standards in an injection logbook, identifying the number of TCLP tumbler in preparation logbook).

m. All reference materials used for instrumental calibration/tunes/checks and the solvents used for dilution of extracts must be directly traceable through reference numbers documented directly in each analytical sequence. Hardcopy injection/analytical logbooks must be maintained (in chronological order) for all BP analyses. These logbooks can be manually (organic, inorganic, wet chemistry, and biological) created or computer generated but must represent a complete history of every injection/analysis performed, reportable or not.

n. Calibrations for all BP-requested analysis must be verified by an independent second source reference after initial calibration. The second source standard must meet the same acceptance criteria as a CCV. It is highly preferable that the second source reference be obtained from a separate vendor other than the vendor used to purchase the primary reference. In situations where a single vendor is used to provide the primary and secondary reference, the LaMP laboratory must obtain written warranties that the two references were not prepared from the same reference material (a separate lot number is not sufficient to document a second source of reference materials in this case).

o. The laboratory must perform MS/MSD or MS/Duplicate samples with every batch of samples. If 11 or more BP samples for a project are received for an analysis, the MS/MSD or MS/Duplicate samples must be performed using a BP sample. If the BP Consultant does not provide sufficient sample volume, the laboratory must contact the BP Consultant and the LaMP Manager (by phone or e-mail) and the Case Narrative must address this deficiency (See Section 2.3).

p. The acceptance limits for LCS, MS, and surrogate compounds must be generated for each sample preparation and analytical method pair (*viz.*, sonication with GC/MS analysis). It is unacceptable to generate acceptance limits using combined preparation or analytical methods (viz., separatory funnel and continuous liquid-liquid extraction with GC/MS analysis). The laboratory should include all primary analyses (but excluding confirming QC failure analyses) for the generation of acceptance limits, unless analyses are determined to be outliers. Accuracy limits of <10% or >200% or precision limits >50% are strictly prohibited for BP projects. Laboratory generated surrogate recovery control limits are <u>not</u> permitted to be wider than published method default control limits (**even if the default limits appeared in an earlier version of a published method**).

q. The laboratory must have documented policies for the appropriate manipulation and corrective actions for initial calibrations. In general, the deletion or dropping of calibration standards other than the lowest or highest concentrations is strictly prohibited. Substitution of individual analyte responses from a second standard analysis instead of replacement of the entire standard is strictly prohibited.

r. The laboratory must have a documented process for manual integration and documented approval of manual integrations by a supervisor. At a minimum, the analyst performing the manual integration should document the rationale for the manual integration and the supervisor should document approval of the manual integration.

s. A method blank and LCS must be performed for and with each batch of samples prepared together using similar preparation techniques (i.e.,

separatory funnel and continuous liquid/liquid extraction). Method blanks and LCSs associated with BP samples must undergo all of the processes as performed on investigative samples, including but not limited to pre-filtration, and sample clean-ups. Method blanks and LCSs must be prepared at a frequency of one per extraction/digestion/preparation batch (batch definition in Section 2.3). For volatile organic aqueous and low-level solid samples, a method blank and LCS must be analyzed on each instrument utilized for analysis and performed every 12 hours. Medium-level (methanol) volatile organic solids are to be considered an extraction preparation. The method blank and LCS associated with medium-level (methanol) volatile organic samples must be prepared at the same time as the associated BP samples and stored with the BP samples until analysis. The goal for all method blank analyses is no measurable contamination. Contamination observed at a concentration greater than one half of the laboratory reporting limit will be acceptable only if the contaminant is not detected in the associated samples or the concentration of the contaminant in the associated samples is greater than 10-times the concentration in the method blank. Criteria for LCS are specified below.

t. For each batch of ICP or ICP/MS samples, the laboratory must analyze a serial dilution sample. If 11 or more BP samples for a project are received, the serial dilution analysis must be performed on a BP sample.

u. For metals and general/wet chemistry analyses (unless specified otherwise in the method requested), a laboratory duplicate and one pre-digestion MS may be optionally prepared and analyzed in lieu of an MS/MSD. For the purpose of this Technical Requirements document, “Full Spike” shall mean project-specific MS/MSD's and LCS's must be prepared and analyzed for all requested target analytes including all site-specific target analytes, including but not limited to oxygenates. Two exceptions are as follows:

    1. When the entire USEPA Appendix IX list of organic compounds is requested for analysis, the spiking list can be limited to the most current USEPA Target Compound List (TCL), where defined, and all site-specific target analytes, including but not limited to oxygenates.

    2. For samples requested for pesticide analyses, <u>all</u> multi-peak (*viz.*, toxaphene and technical chlordane) analytes will not be required to be spiked. In the event only PCBs, technical chlordane and/or toxaphene are requested for analysis, it is expected that the laboratory will spike a sample with a representative multi-peak analyte for the MS/MSD and LCS analysis (*i.e.*, Aroclor-1016 and Aroclor-1260 for PCB analysis).

v. Investigatory samples do not include trip and/or field blanks. These samples must not be used QC sample analyses (MS/MSD or MS/DUP). BP field

personnel shall indicate which sample(s) are to undergo spiking/project-specific QC on the Chain-of-Custody Record and will communicate sample groupings for multiple day sampling events occurring at a site. In the event samples are not designated for spiking purposes and/or insufficient sample is available for spiking, the BP Consultant should be notified (by phone or email) and the project case narrative must note the deficiency.

w. In the event that benzene, toluene, ethylbenzene, *o, p,* or *m*-xylene isomers, any PAH, any requested oxygenate, metal or wet chemistry parameter is outside the acceptance criteria, in the LCS (**or** LCSD), the laboratory ***must*** initiate documented corrective action, including but not limited to re-preparation and reanalysis of all of the associated batch BP samples, provided sufficient BP sample weight/volume exists to perform said re-preparation and reanalysis. In the event sufficient sample weight/volume does not exist to perform re-preparation and reanalysis, BP personnel or their designated representative must be contacted and provided a description of the QC sample failure prior to data reporting. Additional and more specific criteria for the circumstances in which re-preparation and reanalysis will be required based on LCS (**or** LCSD) recoveries is as follows:

    1. No action is necessary when high LCS (**or** LCSD) recoveries are observed and the associated BP samples are reported as "not detected" for the requested target analytes. However, the Case narrative must address this issue.

    2. Re-preparation/reanalysis is required when LCS (**or** LCSD) recoveries for benzene, toluene, ethylbenzene, *o, p,* and *m*-xylene isomers, any polyaromatic hydrocarbon (PAH's), any requested oxygenate, metal or wet chemistry parameter do not meet the acceptance criteria. BP personnel or their designated representative must be contacted and provided a description of the QC sample failure prior to data reporting when sufficient sample weight/volume does not exist to perform re-preparation and reanalysis.

x. The laboratory shall not re-prepare method blanks, MS/MSD, MS/DUP, LCS/LCSD due to failing recovery and/or precision without the preparation of the associated BP samples. In all events, QC failures, holding time exceedances or any other non-standard occurrence must be summarized in the Case Narrative.

y. The laboratory will not have to implement re-preparation and/or reanalysis of the associated BP samples with the caveats detailed in 3.1.5.z when the LCS (**or** LCSD) contains any compound other than benzene, toluene, ethylbenzene, xylene isomers, any PAH, and any requested oxygenate unless specified on a project basis,. **NOTE:** In **all cases**, benzene, toluene, ethylbenzene, xylene isomers, any PAH, any requested oxygenate, metal or

wet chemistry parameter **must** meet the LCS criteria or re-preparation and/or reanalysis is required for all associated BP samples, provided sufficient BP sample weight/volume exists to perform said re-preparation and reanalysis. In the event sufficient sample weight/volume does not exist to perform re-preparation and reanalysis, BP personnel or their designated representative must be contacted and provided a description of the QC sample failure prior to data reporting.

z. The LCS shall be allowed to be outside the control limits but ≥10% for hexachlorocyclopentadiene, N-nitrosodimethylamine, pentachlorophenol, 2,4-dinitrophenol, 4-nitrophenol, benzoic acid, 4-chloro-3-methylphenol, 2-nitroanaline, 3-nitroaniline and 4-chloroaniline without corrective action. The LCS shall be allowed to be outside the control limits by ≥10% for up to four additional volatile organic compounds with the exception of benzene, toluene, ethylbenzene, *m*-xylene, *p*-xylene, *o*-xylene, total xylenes, and any requested oxygenate, and four additional semivolatile compounds with the exception of any PAH, without corrective action. However, re-preparation and reanalysis is required for all associated BP samples, provided sufficient BP sample weight/volume exists to perform said re-preparation and reanalysis if any of these compounds recover at <10% in the LCS (**or** LCSD). In the event sufficient sample weight/volume does not exist to perform re-preparation and reanalysis, BP personnel or their designated representative must be contacted and provided a description of the QC sample failure prior to data reporting.

3.1.5.1 For organic analyses performed using GC/MS, the laboratory must adhere to the requirements of the published methodology. In addition to the published method criteria, the following requirements must be met.

a. For SW-846 analyses, the following compounds must have an initial calibration RSD ≤15% or a curve equation must be generated for quantitation: benzene, toluene, ethylbenzene, *m*-xylene, *p*-xylene, *o*-xylene, total xylenes, all PAHs, all volatile oxygenate compounds, and all surrogate compounds.

b. For SW-846 analyses, all PAHs and semivolatile surrogate compounds must have RRFs >0.05.

c. For SW-846 analyses, the RRFs must be >0.300 for benzene, toluene, ethylbenzene, *m*-xylene, *p*-xylene, *o*-xylene, total xylenes, and all volatile oxygenate compounds except for ethanol and *tert*-butyl alcohol. Ethanol and *tert*-butyl alcohol must have RRFs >0.100. All volatile surrogate compounds must have RRFs >0.200.

d. The laboratory must utilize the solvent/water dilution factor specified in SW-846 Method 8000C section 9.9 for methanol extracted soil samples reported on an “as-received” basis.

e. For SW-846 analyses, percent difference or percent drifts of ≤20% must be met for benzene, toluene, ethylbenzene, *m*-xylene, *p*-xylene, *o*-xylene, total xylenes, all PAHs, all volatile oxygenate compounds, and all surrogate compounds for a CCV standard to be acceptable for these compounds. Results for BP samples may not be reported from analyses associated with an unacceptable CCV standard. The laboratory must analyze bracketing CCV standards if internal standards are not utilized.

f. Multiple (more than one) injection trials of CCV standards must include clear documentation as to the reason for the multiple trials, the corrective action and which trial was used and why. Furthermore, only one repeated trial of calibration check standards is permissible. If the second CCV standard trial fails to meet the criterion, a new initial calibration curve must be constructed.

g. Because of the need for lower target compound detection limits requested of the laboratories within the BP LaMP, it is a BP requirement that LaMP laboratories only report positive GC/MS sample results based on technically valid mass spectral identifications. This is particularly important for trace level compound detections for organic compounds with simplistic spectra and little or no fragmentation. Examples include *tert*-butyl alcohol, ethanol, and non-alkylated PAH's. For comparison of standard and sample component mass spectra, mass spectra obtained from the NIST library are recommended. If spectra obtained on the laboratory’s GC/MS are used, care must be taken to compare these spectra with those in the NIST library to ensure correct assignment and determination of extraneous peaks. Once obtained, these spectra may be used for identification purposes, only if the laboratory’s GC/MS meets the daily instrument performance requirements for BFB or DFTPP. The result should be reported as not-detected if, after careful review and in the technical judgment of the mass spectral interpretation specialist, the GC/MS identification cannot be considered a qualitatively confident mass spectral identification (regardless of the concentration). The BP guidance on assessing mass spectral identifications is as follows:

    1. All ions present in the standard mass spectra at a relative intensity greater than 10.0 percent (most abundant ion in the spectrum equals 100.0 percent) must be present in the sample spectrum. Key secondary ions must also be present for primary ions that are common hydrocarbon ions.

2. The intensities of the characteristic ions of a compound should maximize within one scan of each other.

3. The relative intensities of ions specified above must agree within ± 30% between the standard and sample spectra.

4. The analyst making the comparison and using their professional judgment must carefully consider ions greater than 10 percent in the sample spectrum but not present in the standard spectrum.

h. For selected ion monitoring (SIM) analyses, the following requirements must be met:
   1. The mass spectral detector must be tuned every 12 hours.

   2. Two characteristic ions must be used for the identification of target compounds. The monitored ions must agree within 20% of the relative intensities of the same ions in the reference standard.

   3. The RT of the secondary ion must elute within 2 seconds of the primary ion in the sample.

   4. The relative RT (RRT) of the compound in the sample must be within ±0.006 RRT of the standard compound.

   5. If an external standard quantitation is utilized, a CCV standard must be injected after every 10 injections and a closing CCV standard is required.

   6. If an external standard quantitation is not utilized, the initial calibration must have an RSD ≤20% (or ≤15% for external calibration) or a calibration curve is to be used for quantitation. The target compounds must have percent differences or percent drifts ≤15% (or ≤20% for external calibration) for a CCV standard to be acceptable

i. For air analyses performed by method TO-3, the following requirements must be met in addition to the method criteria:

   1. The holding time for Tedlar bags is 72 hours from collection to analysis.

   2. The holding time for Summa® canister is 30 days from collection to analysis.

   3. The laboratory must perform the analysis of LCS/LCSD.

4. The media used for method blanks must be rotated and repeated use of the same medium (bag or can) for method blanks is unacceptable (*i.e.*, same Summa® canister used for method blanks for all batches).

5. Surrogate compounds must be used as part of the sample analysis. If a Summa® canister is used, samples with surrogate recoveries outside of the acceptance limits must be confirmed through reanalysis of the sample.

6. The initial calibration must contain at least five different standard concentrations. The lowest concentration of the initial calibration must be at or below the reporting limit. If internal standard calibration is utilized, the RSD between the initial calibration standards must be ≤15%. If external standard calibration is utilized, the RSD between the initial calibration standards must be ≤20%.

7. The quantitation of target compounds must be performed based on the average RRF or average RF of the initial calibration.

8. If internal standard calibration is used, the RRFs must be >0.300 for benzene, toluene, ethylbenzene, *m*-xylene, *p*-xylene, *o*-xylene, total xylenes, and all volatile oxygenate compounds except for ethanol and *tert*-butyl alcohol. Ethanol and *tert*-butyl alcohol must have an RRF >0.100. All volatile surrogate compounds must have RRFs >0.200.

9. The laboratory must analyze CCV standards every 10 analyses (regardless if a sample or QC sample) and a closing standard when external standard calibration is used. To be acceptable, the percent difference between the CCV and the average RRF of the initial calibration must be ≤15% for internal standard calibration. The laboratory must analyze CCV standards every 12 hours when internal standard calibration is used. To be acceptable, the percent difference between the CCV and the average CF of the initial calibration must be ≤20% for external standard calibration.

10. If internal standards are used, the acceptance criterion for internal standards in samples is ±40% of the area and the retention time must be ±0.33 minutes of the CCV standard. The acceptance criteria for internal standards in ICV and CCV standards are that the recovery must be within ±40% of the area and the retention time must be ±0.33 minutes of the midpoint initial calibration standard.

11. If a Summa® canister is used, samples with an observed on-column concentration of a target compound above the highest calibration standard must be analyzed at a dilution.

j. For air analyses performed by method TO-14, the following requirements must be met in addition to the method criteria:

1. GC/MS full scan or SIM must be used. The SIM criteria presented in Section 3.1.5.1.h apply to TO-14 analyses.

2. The holding time for a Summa® canister is 30 days from collection to analysis.

3. The laboratory must perform the analysis of LCS/LCSD.

4. The media used for method blanks must be rotated and repeated use of the same medium for method blanks is unacceptable (*i.e.*, same Summa® canister used for method blanks for all batches).

5. Surrogate compounds must be used as part of the sample analysis. The laboratory must perform confirmation analysis if the surrogate compound recovery is outside of the acceptance limit.

6. The lowest concentration of the initial calibration must be at or below the reporting limit.
7. If an internal standard is used, the RRF must be >0.300 for benzene, toluene, ethylbenzene, *m*-xylene, *p*-xylene, *o*-xylene, total xylenes, and all volatile oxygenate compounds except for ethanol and *tert*-butyl alcohol. Ethanol and *tert*-butyl alcohol must have RRFs >0.100. All volatile surrogate compounds must have RRFs >0.200.

8. If internal standards are used, the acceptance criterion for internal standards in samples is ±40% of the area and the retention time must be ±0.33 minutes of the CCV standard. The acceptance criteria for internal standards in ICV and CCV standards are that the recovery must be within ±40% of the area and the retention time must be ±0.33 minutes of the midpoint initial calibration standard.

9. The quantitation of target compounds must be performed based on the average RRF or average RF of the initial calibration.

10. Samples with an observed on-column concentration of a target compound above the highest calibration standard must be analyzed at a dilution.

k. For air analyses performed by method TO-15, the following requirements must be met in addition to the method criteria:

1. GC/MS full scan or SIM must be used. The SIM criteria presented in Section 3.1.5.1.h apply to TO-15 analyses.

2. The holding time for a Summa® canister is 30 days from collection to analysis.

3. The laboratory must perform the analysis of LCS/LCSD.

4. The media used for method blanks must be rotated and repeated use of the same medium for method blanks is unacceptable (*i.e.*, same Summa® canister used for method blanks for all batches).

5. Surrogate compounds must be used as part of the sample analysis. The laboratory must perform confirmation analysis if the surrogate compound recovery is outside of the acceptance limit.

6. The lowest concentration of the initial calibration must be at or below the reporting limit.

7. For BP projects, a %RSD ≥30% between the initial calibration standards for a target compound is not acceptable.
8. If internal standards are used, the RRFs must be >0.300 for benzene, toluene, ethylbenzene, *m*-xylene, *p*-xylene, *o*-xylene, total xylenes, and all volatile oxygenate compounds except for ethanol and *tert*-butyl alcohol. Ethanol and *tert*-butyl alcohol must have RRFs >0.100. All volatile surrogate compounds must have RRFs >0.200.

9. If internal standards are used, the acceptance criterion for internal standards in samples is ±40% of the area and the retention time must be ±0.33 minutes of the CCV standard. The acceptance criteria for internal standards in ICV and CCV standards are that the recovery must be within ±40% of the area and the retention time must be ±0.33 minutes of the midpoint initial calibration standard.

10. The quantitation of target compounds must be performed based on the average RRF or average RF of the initial calibration.

11. Samples with an observed on-column concentration of a target compound above the highest calibration standard must be analyzed at a dilution.

l. For GRO, DRO, and Residual Range Organics (RRO) analyses by GC/MS (SW-846 8260B or 8270C), the following requirements must be met:

1. The mass spectral detector must be tuned every 12 hours, and the tunings must meet the Method 8260B or 8270C criteria.

2. A five-point ICAL must be performed, and must have an RSD of ≤15% if quantitated using average RRF (or r^2≥0.995 and RSD≤30% if a calibration curve is used for quantitation). The RSD must be ≤30% because GRO, DRO, and RRO will be considered CCCs for the analysis. Quantitation will be based on the sum of the areas of the peaks for the analyte and the sum of the peaks for the internal standard compounds.

3. A window-defining mix must be analyzed immediately after the CCV (or immediately after the initial calibration, if samples are to be analyzed after the initial calibration is performed and prior to the CCV analysis). The mix is used to set the retention times of the first-eluting and last-eluting components for the analysis.

4. At least one internal standard compound must be used. Any internal standard compounds in the field samples and quality control samples must display area counts within –50% and +100% of those in the associated CCV (or mid-level ICAL if samples are analyzed after the ICAL). In addition, the retention time for any internal standards must be within ±30 seconds of those for the internal standards in the associated CCV (or mid-level ICAL if samples are analyzed after the initial calibration is performed and prior to the CCV analysis).

5. The method blank must not display GRO, DRO, or RRO at concentrations greater than one half of the RL.

6. The analytes must have percent differences or percent drifts ≤20% for a CCV standard to be acceptable.

7. At least one surrogate compound must be used for the analysis. The recoveries of any surrogates used must be within the limits specified in Method 8260B or 8270C. If one or more surrogate compounds display unacceptable recoveries, then the laboratory must reanalyze the sample to confirm.

3.1.5.2 For analyses performed by GC (all detectors except mass spectral) or HPLC, the laboratory must adhere to the requirements of the published

methodology. In addition to the published method criteria, the following requirements must be met:

a. For SW-846 analyses, the initial calibration RSD must be ≤20% or a curve equation must be generated for quantitation for benzene, toluene, ethylbenzene, *m*-xylene, *p*-xylene, *o*-xylene, total xylenes, all PAHs, all volatile oxygenate compounds, and all surrogate compounds.

b. For SW-846 analyses that utilize an internal standard, all PAHs and semivolatile surrogate compounds must have RRFs >0.05.

c. For SW-846 analyses that utilize an internal standard, the RRFs must be >0.300 for benzene, toluene, ethylbenzene, *m*-xylene, *p*-xylene, *o*-xylene, total xylenes, and all volatile oxygenate compounds except for ethanol and *tert*-butyl alcohol. Ethanol and *tert*-butyl alcohol must have RRFs >0.100. All volatile surrogate compounds must have RRFs >0.200.

d. The laboratory must utilize the solvent/water dilution factor specified in SW-846 Method 8000C Section 9.9 for methanol extracted soil samples reported on an "as-received" basis.

e. Regardless of internal or external standard calibrations, the laboratory must analyze continuing calibration standards after every 10 injections/analyses (regardless of sample or QC sample) and acceptable calibration checks must bracket, before and after, all reported BP samples. CCV standards must have percent differences or percent drifts ≤15% for all BP requested target compounds and surrogate compounds to be considered acceptable.

f. If the laboratory elects to **routinely** perform duplicate CCV standard analyses as part of an auto-sampler sequence, the laboratory must consistently evaluate and report BOTH CCV standard analyses. If the first CCV is not acceptable and the second CCV passes, the sample analyses are acceptable. If the second CCV standard is not acceptable, all samples bracketed (preceding 10 and following 10 analyses) must be repeated.

g. Multiple (more than one) injection trials of continuing calibration check standards must include clear documentation as to the reason for the multiple trials, the corrective action and which trial was used and why. Furthermore, only one repeated trial of calibration check standards is permissible. If the second calibration check standard trial fails to meet the criterion, a new initial calibration curve must be constructed.

h. If performed, instrument blanks must be analyzed after the continuing calibration standards. Instrument blanks must include surrogate/internal

standard compounds. In order for the instrument blank to be acceptable, no target compound may be observed at or above one half of the laboratory's reporting limit. The strategic placement and analysis/injection of a blank (or any other form of conditioner) consistently immediately prior to the analysis of a continuing calibration standard (and not between samples at a similar frequency) is forbidden.

i. All positive results by GC and HPLC analyses must be confirmed on a second dissimilar column (for GC analyses) or detector (for HPLC analyses) with the exception of VOAs, PCBs, GRO, and DRO compounds. The lower of the two analytical column results must be reported unless directed otherwise on a project-specific basis. It should be noted that laboratories must comply with state specific and/or project specific requirements that stipulate second column confirmation of VOA and PCB compounds analyzed by GC.

j. For air analyses performed by method TO-3, the requirements defined in 3.1.5.1.i must be met in addition to the method criteria.

3.1.5.3. For analyses performed by GFAA, ICP/MS, CVAA and ICP, the laboratory must adhere to the requirements of the published methodology. In addition to the published method criteria, the following requirements must be met:

a. The laboratory must analyze low-level (within two-times the laboratory's reporting limit) reporting limit check standard before the analysis of BP samples, every 8 hours, and after analyses of BP samples (whichever is more frequent) and utilize a 50-150% acceptance criterion. Only BP samples that are bracketed by these acceptable low-level reporting limit check standards can be reported.

b. For all GFAA analyses, post-digestion spikes are required to be performed on each BP sample with an 85-115% acceptance criterion. If this criterion is not met the sample must be reanalyzed using a three-point method of standard additions.

c. For ICP and ICP/MS analyses, the type and strengths of acids must be the same between sample digests and standards or an internal standard must be used to electronically correct for intensity differences.

d. The laboratory is required to analyze the ICP or ICP/MS interference check sample mixtures A and AB (ISCA and ICSAB) before the analysis of BP samples, every 8 hours, and after analyses of BP samples (whichever is more frequent). Observed ICP or ICP/MS interference (target analytes not included in the ICSA with a concentration greater that twice the reporting limit) is not acceptable. Recoveries of analytes in the

ICSAB standard outside of 80% to 120% are not acceptable. Only BP samples that are bracketed by these acceptable ICSA and ICSAB standards can be reported.

e. The laboratory is required to evaluate the RPD between multiple instrument integrations for ICP, ICP/MS, GFAA, and CVAA analyses. The RPD or RSD must be less than 20% if the analyte concentration is greater than the reporting limit. If the RPD or RSD is above 20%, the laboratory must reanalyze the sample.

f. The laboratory is required to evaluate the concentration of the ICB and CCB analyses. If the absolute value of a negative concentration exceeds twice the MDL, the laboratory shall consider the ICB or CCB analysis unacceptable. The laboratory may not report results bracketed by an unacceptable ICB or CCB analysis. Associated samples must be reanalyzed unless the concentration of the target metal in the associated sample is greater than 10-times the absolute value of the ICB or CCB result.

3.1.5.4 For analyses performed by gravimetric, colorimetric, potentiometric, titrimetric, ion chromatography, and other general chemistry methodologies, the laboratory must adhere to the requirements of the published methodology. In addition to the published method criteria, the following requirements must be met:

a. In the event that initial calibration curves are not prepared on the same day that BP samples are analyzed, the calibration curve must be verified on the day the BP samples are analyzed by a check standard at **both** the low end and high end (*e.g.,* one below the midpoint and one above the midpoint of the curve) of the calibration curve using a 90-110% acceptance criterion.

b. For analyses that include CCV standards, the laboratory must analyze CCVs after every 10 injections/analyses and acceptable calibration checks must bracket, before and after, all reported BP samples. CCV standards must meet a 90-110% recovery acceptance criterion, or the method specified CCV criteria.

c. If the laboratory elects to **routinely** perform duplicate CCV standard analyses as part of an auto-sampler sequence, the laboratory must consistently evaluate and report BOTH CCV standard analyses. If the first CCV is not acceptable and the second CCV passes, the sample analyses are acceptable. If the second CCV standard is not acceptable, all samples bracketed (preceding and following 10 analyses) must be repeated.

d. Multiple (more than one) repeated injection trials of CCV standards must include clear documentation as to the reason for the multiple trials, the corrective action and which trial was used and why.

3.1.6 Two types of data reporting will be required for BP work and will be specified on a project-by-project basis. These are specified as follows: BP Limited Deliverables and BP Full Deliverables and are defined in Appendix C. Unless specified in the referenced analytical method, sample results must ***not*** be blank-corrected. Unless specifically requested otherwise or required by state-specific requirements, all solid sample results must be reported on a dry-weight basis. In cases where results are requested on a wet-weight basis, separate reporting percent solids will be required. Case narratives must be provided which document any non-standard occurrences within the batch of samples submitted for analysis. Any and all problems that may be apparent in the analyses should be relayed to BP or its designated representative, who will then be responsible for notifying the appropriate personnel and implementing project-level corrective action, such as re-sampling. ***All*** sample reporting forms, QC forms and raw data (*viz.*, Full data package) ***must*** be labeled with BP or its designated representative sample identifications.

BP Limited data deliverables are required to be delivered or transferred within the standard 14-calendar day turn-around time. The turn-around time for BP Full data package is 28 calendar days. BP Full must contain all information, formatted, paginated and consistently structured in a manner in which third-party data validation can be performed by a competent chemist.

3.2 PERFORMANCE EVALUATION (PE) TESTING & FACILITY AUDITS

3.2.1 All LaMP laboratory facilities will be required to participate in performance evaluation (PE) testing at a frequency deemed appropriate by BP. **BP will select the vendor and bear the cost of sample preparation of double blind PE samples.** ***The laboratory will bear the cost associated with analyzing these PE samples****.* In the case of double blind PE's, the LaMP laboratories will be notified after the results are reported such that BP is not charged for the analysis. Each LaMP laboratory will receive the results of their PE samples in a report prepared by BP's authorized representative. LaMP laboratories will be expected to investigate and submit a corrective action report (including supporting documentation) within 14 calendar days to the LaMP Program Manager and additional authorized representatives for any identified PE failures.

3.2.2 All LaMP lab facilities will be required to participate in quarterly single blind PE samples for designated matrices and analytes. The cost of acquisition and analysis of these samples shall be borne by the laboratory. Labs shall use the sample vendor specified by BP, currently APG. Results must be provided to the Global Laboratory Evaluation and Management Program (GLEMP), of which ARC is a member.

3.2.3 At a frequency deemed appropriate by BP, as part of the LaMP quality monitoring program, LaMP BP Full data packages will be randomly selected and requested after the fact to undergo formal data validation by BP's authorized representative. ***The laboratory will bear the cost associated with updating and providing the BP Full packages****.* Within 14 calendar days of receipt of a copy of the data validation report, the LaMP laboratory will be required to prepare and submit a response and/or corrective action report (including supporting documentation) to the LaMP Program Manager and additional authorized representatives.

3.2.4 Laboratories shall submit to and successfully complete systems and performance audits conducted by BP authorized representatives, initially and periodically thereafter for program participation. ***Such audits are required for each facility performing work in the LaMP, including all owned or affiliated laboratory facilities. Within 14 calendar days of the receipt of the final laboratory audit report, the LaMP laboratory will be required to prepare and submit a response and/or corrective action report (including supporting documentation) to the LaMP Program Manager and additional authorized organizations. The costs associated with such audits shall be borne by each laboratory.*** The laboratory will be required to contract directly with BP's quality assurance consultant for the on-site audit. The labor costs associated with the preparation, on-site audit, and report generation for the annual audits will be fixed for all laboratories while costs may vary based on location due to travel (*i.e.,* lodging, rental car, and associated expenses).

3.2.5 As part of ongoing quality assurance monitoring, laboratories agree to share the results, and any corrective actions there from, of internal or third party industry (*e.g.*, state or NELAP) certification studies such as PE samples or laboratory audits with BP or its designated representatives on a quarterly basis. The laboratory will provide the audit report or PE sample results and the corrective action response to the LaMP Manager via an electronic method (e-mail or web-site).

3.2.6 In all cases where LaMP laboratory corrective action is warranted, the corrective action must include a determination of root cause, documented training, and in person documented verification by laboratory QA personnel that the implemented corrective action was completely successful prior to closure. Corrective action documentation will be reviewed during each annual audit.

4.0 SCHEDULING AND INVOICING

4.1 DELIVERABLES

4.1.1 The required BP data package deliverables (BP Full or Limited) will be specified by BP or its designated representative. ***Unless otherwise directed in writing, one complete data package, electronic data deliverable (EDD), and PDF of the data package must be submitted to BP or its designated representative*** within 14 calendar days of receipt of the last sample in the BP delivery group for Limited data deliverables, and within 28 calendar days for Full data deliverables. For a Full data package deliverable, a Limited data package and EDD are due within 14 calendar days of receipt of the last sample in the BP delivery group with the Full data package deliverable to follow in 28 calendar days of receipt of the last sample in the BP delivery group. For the purposes of sample groupings, a BP delivery group is considered to include all samples received for the same project or site, to a maximum of 20 investigative samples not to exceed 5 consecutive days of sampling. Data packages must be provided for each BP delivery group and must not contain fewer than 20 samples, unless fewer than 20 samples were received (within an open BP delivery group period of 5 days) or faster turnaround time is required. Data package deliverables are to conform to the data package deliverables specified in Appendix C. The laboratory is responsible for ensuring that all electronic and hard copy deliverables are in parity, including but not limited to significant figures, analyte names, any qualifiers used, and footnotes used.

LaMP laboratories shall not report data for any analytes that were not specifically requested by BP. LaMP laboratories shall not report, transmit or disseminate any information (without limitation) regarding BP samples to any third-party who is not an authorized, approved BP designated representative, without formal written permission from BP.

4.1.2 The laboratory is required to provide an EDD with each data set without additional cost to BP. EDDs are expected to be error-free. In the event one is not, the laboratory will revise and re-issue an error-free EDD at no additional cost to BP.

BP may request that contract laboratories provide EDDs in a specific format at any time during the life of the contract. BP may request that all EDDs be uploaded (error-free) into a database of BP's choosing at anytime during the life of the contract.

4.2 INVOICING

All invoicing for work under the LaMP will be invoiced thru BP's ENFOS system unless specifically requested by BP. All invoicing will be performed through the use of Stock Keeping Units (SKUs). BP is responsible for maintaining and distributing the SKU list to participating laboratories.

4.3 STORAGE OF PROJECT DATA

All data, instrument output (inclusive of electronic media), controlled logbooks, reports, hard copy and electronic copy of all data packages delivered, and all applicable peripheral documentation, including but not limited to financial documents and invoices generated by each LaMP laboratory must be stored in an organized, categorized, inventoried fashion for 7 years after completion of a project, or, at BP's request, any and all data must be submitted to BP and/or designated /authorized representative at any point prior to the completion or at completion of the contract. All electronic and hardcopy data must be stored in an easily accessible climate-controlled environment. Electronic data must be stored in a secure, limited-access area with redundant copies stored in fireproof vaults and stored off-site of the LaMP laboratory facility.

4.4 LABORATORY INFORMATION TECHNOLOGIES

BP relies heavily on laboratory data to accomplish its mission. The accuracy and integrity of these data are essential to BP's ability to effectively manage corporate programs and environmental issues. Laboratory data are critical assets and BP expects contractors to manage and protect it as such.

Laboratory data are exposed to potential loss and misuse from a variety of accidental and deliberate causes. The integrity of computer-resident data is at risk in many laboratories providing scientific and technical data to BP. Inadequate system security, data verification, standardized procedures, designation of responsibility, and documentation are to a large extent responsible for these risks.

4.4.1 BP relies heavily on the philosophy and guidance provided by the EPA Good Automated Laboratory Practices (GALP). Section 8 of document 2185 - Good Automated Laboratory Practices, (http://www.epa.gov/irmpoli8/ciopolicy/2185.pdf) is provided below for your review. Specific BP requirements are provided after this section.

Excerpt from EPA document "2185 - Good Automated Laboratory Practices"

8.1 LABORATORY INFORMATION MANAGEMENT

When LIMS Raw Data (see 8.4.1) are collected, analyzed, processed, or maintained, laboratory management shall:

8.1.1 ensure that personnel clearly understand the function(s) they are to perform on the LIMS.

8.1.2 ensure that a Quality Assurance Unit (QAU) monitors LIMS activities as described in 8.3.

8.1.3 ensure that personnel, resources, and facilities are adequate and available as scheduled.

8.1.4 receive reports of QAU inspections of the LIMS (see 8.3.3) and audits of LIMS Raw Data (see 8.3.5) and ensure that corrective actions are promptly taken in response to any deficiencies.

8.1.5 approve the standard operating procedures (SOPs) setting forth the methods that assure LIMS Raw Data integrity, ensure that any deviations from SOPs and applicable GALP provisions are appropriately documented and that corrective actions are taken and documented, and approve subsequent changes to SOPs (see 8.11).

8.1.6 assure that each applicable GALP provision is followed. With the exception of 8.1, 8.2, and 8.3, laboratory management may delegate GALP implementation and compliance to one or more responsible persons.

8.2 PERSONNEL

When LIMS Raw Data are collected, analyzed, processed, or maintained, laboratory management shall ensure that all LIMS support staff and users:

8.2.1 have adequate education, training, and experience to perform assigned LIMS functions.

8.2.2 have a current summary of their training, experience, and job description, including their knowledge relevant to LIMS design and operation, maintained at the facility.

8.2.3 are of sufficient number for timely and proper operation of the LIMS.

8.3 QUALITY ASSURANCE UNIT

When LIMS Raw Data are collected, analyzed, processed, or maintained, laboratory management shall designate a Quality Assurance Unit (QAU) to monitor LIMS functions and procedures. The QAU shall:

8.3.1 be entirely separate from and independent of LIMS personnel, and shall report directly to laboratory management.

8.3.2 have immediate access to the LIMS data, SOPs, and other records pertaining to the operation and maintenance of the LIMS.

8.3.3 inspect the LIMS at intervals adequate to ensure the integrity of the LIMS Raw Data (see 8.3.5); prepare inspection reports that include a description of the LIMS operation inspected, the dates of the inspection, the person performing the inspection, findings and problems observed, action recommended and taken to resolve existing problems, and any scheduled dates for re-inspection; and report to laboratory management any problems that may affect data integrity.

8.3.4 determine that no deviations from approved SOPs were made without proper authorization (see 8.1.5) and sufficient documentation.

8.3.5 periodically audit the LIMS Raw Data to ensure their integrity.

8.3.6 ensure that the responsibilities and procedures applicable to the QAU, the records maintained by the QAU, and the method of indexing such records are documented and are maintained.

8.4 LIMS RAW DATA

Laboratory management shall ensure that:

8.4.1 LIMS Raw Data (LRD) and LRD storage media on which they reside (see 9. DEFINITIONS LIMS Raw Data and LIMS Raw Data

storage media) are identified and documented. This documentation shall be included in the laboratory's SOPS.

8.4.2 the individual(s) responsible for entering and recording LIMS Raw Data is (are) uniquely identified when the data are recorded, and the time(s) and date(s) are documented.

8.4.3 the instrument transmitting LIMS Raw Data is uniquely identified when the data are recorded, and the time and date are documented.

8.4.4 procedures and practices to verify the accuracy of LIMS Raw Data are documented and included in the laboratory's SOPs, and managed as described in 8.11.

8.4.5 procedures and practices for making changes to LIMS Raw Data are documented and provide evidence of change, preserve the original recorded documentation (see 8.4.2 and 8.4.3), are dated, indicate the reason for the change, identify the person who made the change and, if different, the person who authorized the change. These procedures shall be included in the laboratory's SOPS, and managed as described in 8.11.

8.5 SOFTWARE

When software is used to collect, analyze, process, or maintain LIMS Raw Data, laboratory management shall ensure that:

8.5.1 SOPS are established, approved, and managed as described in 8.11 for:

8.5.1.1 development methodologies that are based on the size and nature of software being developed. EPA and its agents shall comply with *EPA Information Resources Management Policy Manual, Chapter 17*.

8.5.1.2 testing and quality assurance methods to ensure that all LIMS software accurately performs its intended functions, including: acceptance criteria, tests to be used, personnel responsible for conducting the tests, documentation of test results, and test review and approval.

8.5.1.3 change control methods that include instructions for requesting, testing, approving, documenting, and implementing changes. When indicated, change control

methods shall also include reporting and evaluating problems, as well as implementing corrective actions.

8.5.1.4 version control methods that document the LIMS software version currently used.

8.5.1.5 maintaining a historical file of software, software operating procedures (manuals), software changes, and software version numbers.

8.5.2 documentation is established and maintained to demonstrate the validity of software used in the LIMS:

8.5.2.1 for existing and commercially-available LIMS, minimum documentation shall include, but not be limited to: a description of the software and functional requirements; listing of all algorithms and formulas; and, as they occur, testing and quality assurance, installation and operation, maintenance/enhancement, and retirement.

8.5.2.2 for new LIMS development or modification of existing LIMS, documentation shall cover all phases of the generic software life cycle. EPA laboratories and those of its agents (contractors and grantees) shall comply with the documentation requirements specified in *EPA Information Resources Management Policy Manual, Chapter 17*.

8.5.3 all documentation specified in 8.5.2 is readily available in the facility where the software is used, and the SOPS specified in 8.5.1 are readily available in the laboratory areas where procedures are performed.

8.5.4 a historical file of software and the documentation specified in 8.5.2 are retained according to procedures outlined in 8.9.

8.6 SECURITY

Laboratory management shall ensure that security practices to assure the integrity of LIMS data are adequate. EPA laboratories and those of its agents (contractors and grantees) shall comply with EPA's Information Security Policy.

8.7 HARDWARE

When LIMS Raw Data are collected, analyzed, processed, or maintained, laboratory management shall ensure that LIMS hardware and communications components are:

8.7.1 of adequate design and capacity, and a description is documented and maintained.

8.7.2 installed and operated in accordance with manufacturer's recommendations and, at installation, undergo acceptance testing that conforms to acceptance criteria. SOPs shall be established and maintained to define the acceptance criteria, testing, documentation, and approval required for changes to LIMS hardware and communications components.

8.7.3 adequately tested, inspected, and maintained. SOPs for and documentation of these routine operations shall be maintained. Documentation of non-routine maintenance shall also include a description of the problem, the corrective action, acceptance testing criteria, and the acceptance testing performed to ensure that the LIMS hardware and communications components have been adequately repaired.

8.8 COMPREHENSIVE TESTING

When LIMS Raw Data are collected, analyzed, processed, or maintained, laboratory management shall ensure that comprehensive testing of LIMS performance is conducted, at least once every 24 months or more frequently as a result of software (see 8.5.2) or hardware (see 8.7.2) changes or modifications. These tests shall be documented and the documentation shall be retained and available for inspection or audit.

8.9 RECORDS RETENTION

Laboratory management shall ensure that retention of LIMS Raw Data, documentation, and records pertaining to the LIMS comply with EPA contract, statute, or regulation; and SOPs for retention are documented, maintained, and managed as described in 8.11.

8.10 FACILITIES

When LIMS Raw Data are collected, analyzed, processed, or maintained, laboratory management shall ensure that:

8.10.1 the environmental conditions of the facility housing the LIMS are regulated to protect against LIMS Raw Data loss.

8.10.2 environmentally adequate storage capability for retention of LIMS Raw Data, LIMS Raw Data storage media, documentation, and records pertaining to the LIMS are provided.

8.11 STANDARD OPERATING PROCEDURES

Laboratory management shall ensure that:

8.11.1 SOPs include, but are not limited to, those specified in 8.4.1, 8.4.4, 8.4.5, 8.5.1.1 through 8.5.1.5, 8.7.2, 8.7.3, and 8.9. Each current SOP shall be readily available where the procedure is performed.

8.11.2 SOPs are periodically reviewed at a frequency adequate to ensure that they accurately describe the current procedures.

8.11.3 SOPs are authorized and changed in accordance with 8.1.5.

8.11.4 a historical file of SOPs is maintained.

End excerpt from EPA document.

4.4.2 BP SPECIFIC PROJECT REQUIREMENTS

Contract Laboratories should anticipate an audit and concrete testing of capabilities based on EPA GALP and the following BP specific requirements:

- The laboratory must maintain a single point of contact for technical questions regarding laboratory output such as hardcopy packages and EDDs.
- The laboratory must maintain a formal data-deliverables-change-management process that not only addresses individual deliverable issues, but also addresses continuous improvement.
- Overwriting or disposal of any electronic media prior to 7 years of final data reporting is strictly prohibited.
- LaMP laboratories must exercise “best practices” in terms of frequent, redundant electronic backup procedures to ensure that BP data is not lost.
- The laboratory must be able to provide EDDs in a wide variety of formats and be able to demonstrate the ability to generate EDDs quickly and accurately.
- The laboratory will be expected to generate error-free EDDs.

- The laboratory must be able to quickly generate revisions to EDDs if issues are revealed. It should be recognized that both a valid correct EDD and hardcopy deliverable define completion for on time delivery tracking.

- The laboratory must be able to quickly reproduce a specific correct project deliverable for a period equivalent to the retention of hardcopy data.

- The laboratory must be able to provide normalized data within each EDD regardless of logistical issues such as laboratory section, network facility or subcontracting laboratory the data are generated from.

- The laboratory must provide an appropriate level of QC on all output to ensure that it is correct, complete, internally consistent, and that all outputs such as hardcopy and EDDs match. A best practice of generating all deliverables from the same system should be in place. If appropriate QC has not been performed and errors or inconsistencies are determined in data, the laboratory will be responsible for any BP costs required to manage the data into the required state. BP should not be a deliverables oversight agent for the laboratory.

- The laboratory must be able to adhere to project-specific valid values and data output requirements as requested and provided for by individual project teams.

- The laboratory must employ internal best-data-handling practices to eliminate any manual data entry.

- The laboratory must be able to accept electronic Chain-of-Custody data where elected by project teams to assist with the elimination of manual entry errors.

- The laboratory must be able to provide an EDD that includes either all runs of the data or “best of” data, as elected by the project team.

- The laboratory must maintain appropriate personnel and SOPs to efficiently and quickly provide accurate deliverables as requested by the project team.

- The laboratory must provide appropriate computer security and protection against vulnerabilities or risks as follows:

    - Establish an organization-wide information security program. Each laboratory must ensure that their organization's information security program provides security awareness training.

- Ensure that information and applications within the laboratory are adequately protected.
- Ensure that all general support systems and major applications within the organization (including labs, satellite offices, etc.) have security plans in place and that security plans are updated annually or when a significant change occurs.
- Provide an annual certification to BP that security plans are in place and current for each major application and general support system.
- Provide BP with notice in advance of significant changes to IT infrastructure, especially LIMS.
- Collaborate with BP on IT system best practice development.
- Ensure the continuity of operations of automated information systems and facilities that support critical functions.
- Designate Information Security Officer(s) who are knowledgeable in information technology and security.
- Ensure that employees and contractor personnel understand their security responsibilities and those organizational information security regulations are properly distributed.
- Ensure that any deliverable provided by the laboratory is virus free.
- Ensure that all appropriate computer systems required to reproduce any client data be backed up as appropriate.
- Ensure that audit trails exist for all data processes and data modifications and that the audit trail identifies specific personnel as responsible for any given segment of the process.

4.4.4 References:

- 2185 - Good Automated Laboratory Practices, USEPA, Office of Information Resources Management, Research Triangle Park, NC 27711, 8/10/95.
- IRM POLICY MANUAL 2100A16 12/20/99

TABLE 1
COC

Atlantic Richfield Company

bp A BP affiliated company

Chain of Custody Record

Project Name:

BP BU/AR Region/Enfos Segment:

State or Lead Regulatory Agency:

Requested Due Date (mm/dd/yy):

Page____ of _____.

On-site Time:	Temp:
Off-site Time:	Temp:
Sky Conditions:	
Meteorological Events:	
Wind Speed:	Direction:

Lab Name:	BP/AR Facility No.:	Consultant/Contractor:
Address:	BP/AR Facility Address:	Address:
	Site Lat/Long:	
Lab PM:	California Global ID No.:	Consultant/Contractor Project No.:
Tele/Fax:	Enfos Project No.:	Consultant/Contractor PM:
BP/AR EBM:	Provision or OOC (circle one)	Tele/Fax:
Address:	Phase/WBS:	Report Type & QC Level:
	Sub Phase/Task:	E-mail EDD To:
Tele/Fax:	Cost Element:	Invoice to: Consultant or BP or Atlantic Richfield Co. (circle one)

Lab Bottle Order No:				**Matrix**						**Preservative**						**Requested Analysis**										
Item No.	**Sample Description**	**Time**	**Date**	Soil/Solid	Water/Liquid	Air		**Laboratory No.**	No. of Containers	Unpreserved	H_2SO_4	HNO_3	HCl	Methanol												**Sample Point Lat/Long and Comments**
1																										
2																										
3																										
4																										
5																										
6																										
7																										
8																										
9																										
10																										

Sampler's Name:	**Relinquished By / Affiliation**	**Date**	**Time**	**Accepted By / Affiliation**	**Date**	**Time**
Sampler's Company:						
Shipment Date:						
Shipment Method:						
Shipment Tracking No:						

Special Instructions:

Custody Seals In Place: Yes / No | Temp Blank: Yes / No | Cooler Temp on Receipt: ____°F/C | Trip Blank: Yes / No | MS/MSD Sample Submitted: Yes / No

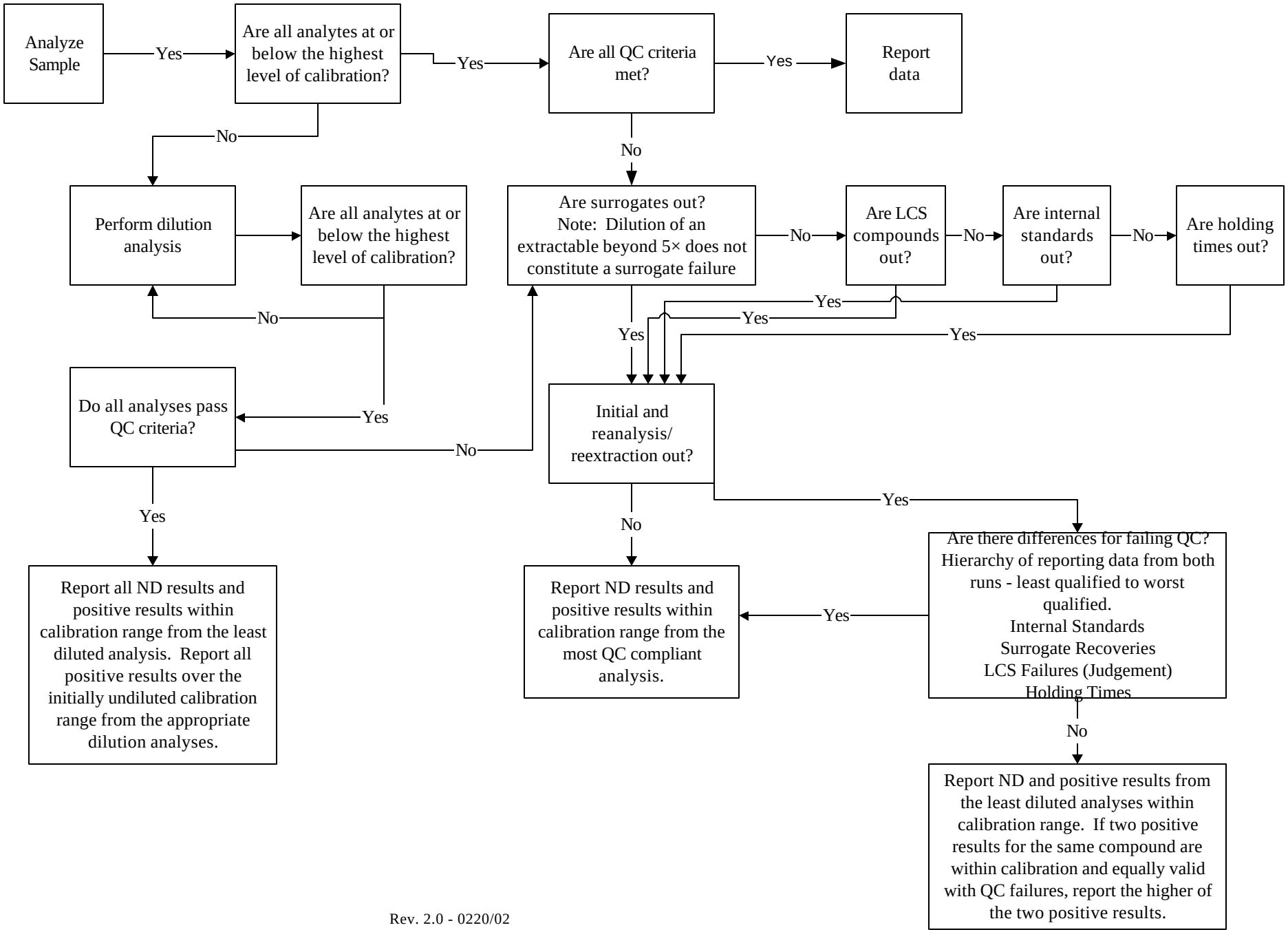
BP COC Rev. 5 10/11/2006

Table 2

Multi-Analyses/Extraction Flow Chart

[insert flow chart]

bp GCLN Multi-Analysis/Extraction Flow Chart



APPENDIX A

GUIDANCE FOR SUMMA® CANISTER AND FLOW CONTROLLER CLEANING AND CERTIFICATION FOR PROJECTS REQUIRING METHOD TO-14 OR TO-15 ANALYSIS

BP undertakes sampling and analysis of ambient air for a variety of purposes. For some applications, the detection limits for volatile organics are not critical and the expected concentrations may be in the hundreds or thousands of part per billion by volume (ppbv). For other projects (*e.g.,* vapor intrusion studies), low or even sub-ppbv sensitivity may be required; when low-level detections are reported for these studies, there must be a high degree of confidence that the reported detections are not artifacts of the sampling and analytical procedures. This document provides BP environmental professionals and consultants with guidance on how to ensure cleanliness of Summa® canisters (and the peripheral flow controller equipment) in order to minimize the possibility of false positive, low-level artifacts. In addition, sensitive air projects should include (but not be limited to) using a LaMP laboratory with the appropriate expertise, developing appropriate data quality objectives (including an appropriate QC sample regime), and applying a critical data validation effort upon sample data issuance by the laboratory. For more information, please contact the LaMP Program Manager [Dennis Beckmann (beckmadd@bp.com)].

This guidance provides information on the labeling, cleaning, preparation, tracking, and documentation that should be maintained for Summa® canisters and flow controllers when requesting analysis by USEPA Method TO-14 or TO-15. There are options for several levels of canister and flow cleaning depending on the required detection sensitivity and the level of project-specific liability associated with laboratory reporting of low-level positive results. These options and the issues to consider are presented on Figure 1.

Finally, it is important for BP environmental professionals and consultants to carefully conduct pre-planning for each air investigation from the standpoint of understanding what compounds are included on the laboratory's target analyte list, what the typical reporting limit is for each of these target analytes, and most importantly, what detection sensitivity ("how low do you need to confidently go") is appropriate for the planned investigation.

Summa® Canisters

Summa® canisters are enclosed, highly-polished stainless steel samplers that are available in a variety of sizes (up to 15 liters). When the manufactured interior surface is covered with a thin layer of water molecules, volatile organic compounds can be stored without chemical breakdown or loss. Flow controllers enable constant air sampling into the canister over pre-determined periods of time.

- The laboratory should assign and inscribe each new canister with a permanent unique number that can be used to identify and track the functional uses of the canister.

- The laboratory should tag each canister with a label indicating the canister condition; the tag must include the date the canister was cleaned, the date the canister was certified clean, and the initials of the laboratory analyst who performed the certification. After sampling, the BP consultant must clearly identify the sample in the canister on the tag.

- The laboratory should clean the canisters in batches of 12 or less using a cycling cleaning manifold that is specifically designed to heat and purge the canister. At least four cycles of evacuation and pressurizing with nitrogen should be used to cleanse the system of any residual volatile organic compounds. Additional heating and steaming may be needed to cleanse higher molecular organics and/or inorganic salts, some of which may break down to form volatile organic compounds.

- After cleaning, the laboratory should check the canisters for leaks by pressurizing to 30 psi with humid nitrogen and allowing the canister to sit at ambient temperature for at least 24 hours. There should be no greater than a 2 psi loss in pressure for canister integrity to be demonstrated. Documentation of the before and after pressures and the date and time of each pressure check should be maintained by the laboratory.

- Sub-ppbv Sensitive Trace-Level Analysis (BP Trace-Level Certification).

    - The BP consultant should inform the laboratory of the requested target compounds and request a listing of the laboratory's reporting limits for those target compounds to ensure that data quality objectives can be met.

    - *Each* canister must be analyzed by GC/FID or GC/MS for all target compounds requested by BP.

    - To be considered BP Trace-Level Certification clean, a canister must not contain any target analyte at a level greater than one-half the laboratory's reporting limit. If contaminant levels less than one-half the laboratory's reporting limit are important to a project, then special cleaning is necessary to certify canisters down to the laboratory's method detection limit (MDL). This special cleaning may have limited feasibility for certain problem compounds (*e.g.*, methylene chloride, toluene). BP consultants should contact the laboratory to ascertain if there are any problem compounds for which the canister cannot be certified to the MDL.

    - Canisters that cannot meet BP Trace-Level Certification cleanliness requirements cannot be used for BP projects for which BP Trace-Level Certification is required.

    - Once certified clean, the canisters should be evacuated to <0.05 mm Hg, capped, and tagged. The canisters are then ready for shipment and must be used for sampling within 28 days of the final evacuation. Accurate laboratory records must be maintained for each canister and must include (but not be limited to) an historical record of all previous canister usage, the cleaning documentation, and the certification data. The laboratory should issue canisters

that are tagged with information that includes the evacuation pressure and certification date. Canisters should be issued to BP consultants under formal Chain-of-Custody.

- Routine Low to Medium ppbv (and Higher) Analysis (BP Routine-Level Certification)

    - The BP consultant should inform the laboratory of the requested target compounds and request a listing of the laboratory's reporting limits for those target compounds to ensure that data quality objectives can be met.

    - One canister from a batch of 12 cleaned canisters must be analyzed by GC/FID or GC/MS for all target compounds requested by BP. The laboratory must use the canister in the batch of 12 with the highest overall VOC concentrations reported from its last use for the certification analysis.

    - To be considered BP Routine-Level Certification clean, the selected "worst case" batch canister must not contain any target analyte at a level greater than or equal to the laboratory's reporting limit. If contaminant levels less than the laboratory's reporting limit are important to a project, BP Trace-Level Certification should be selected.

    - Canisters that cannot meet BP Routine-Level Certification cleanliness requirements cannot be used for BP projects for which BP Routine-Level Certification is required.

    - Once certified clean, the canisters should be evacuated by the laboratory to <0.05 mm Hg, capped, and tagged. The canisters are then ready for shipment and must be used for sampling within 28 days of the final evacuation or the canister must be recertified.

    - Accurate laboratory records must be maintained for each canister and include (but not be limited to) an historical record of all previous canister usage, the cleaning documentation, and the certification data. The laboratory should issue canisters that are tagged with information that includes the evacuation pressure and certification date. Canisters should be issued to BP consultants under formal Chain-of-Custody.

Flow Controllers

- The laboratory should assign each new flow controller a permanent unique number that can be used to identify and track the functional uses of the flow controller.

- The laboratory should tag each flow controller with a label indicating the condition of the flow controller; the tag must include the date the controller was cleaned, the date the controller was certified clean, and the initials of the laboratory analyst who performed the certification.

- The laboratory should clean the flow controller by constant flushing with nitrogen. The flushing time should be established based on the most recent use of the controller.

- Sub-ppbv Sensitive Trace-Level Certification Analysis (BP Trace-Level Certification)

    - The BP consultant should inform the laboratory of the requested target compounds and request a listing of the laboratory's reporting limits for those target compounds to ensure that data quality objectives can be met.

    - After cleaning, the nitrogen passed through each controller must be analyzed by GC/FID or GC/MS for all target compounds requested by BP. Flow controllers can be analyzed individually or in series to certify cleanliness.

    - To be considered BP Trace-Level Certification clean, a flow controller (or multiple controllers in series) must not contain any target analyte at a level greater than one-half the laboratory's reporting limit. If contaminants at levels less than one-half the laboratory's reporting limit are important to the project, special cleaning will be necessary to certify flow controllers down to the laboratory's MDL. This special cleaning may have limited feasibility for certain problem compounds (*e.g.*, methylene chloride, toluene). BP consultants should contact the laboratory to ascertain if there are any problem compounds for which the flow controller cannot be certified to the MDL.

    - Flow controllers that cannot meet BP Trace-Level Certification cleanliness requirements cannot be used for BP projects for which BP Trace-Level Certification is required.

    - Once certified clean, the flow controller must be checked for leaks by connecting the flow controller to a pressurized gas line and using an electronic leak-checking device (or equivalent).

    - Once the flow controller is verified to be leak-free, the flow controller should be tagged and is ready for use.

    - Accurate laboratory records must be maintained for each flow controller and include (but not be limited to) an historical record of all previous flow controller usage, the cleaning documentation, and the certification data.

- Routine Low to Medium ppbv (and higher) Analysis (BP Routine-Level Certification)

    - The BP consultant should inform the laboratory of the requested target compounds and request a listing of the laboratory's reporting limits for those target compounds to ensure that data quality objectives can be met.

    - After cleaning, the nitrogen passed through each flow controller must be analyzed by GC/FID or GC/MS for all target compounds requested by BP. Flow controllers can be analyzed individually (or in series) to certify cleanliness.

- To be considered BP Routine-Level Certification clean, a flow controller must not contain any target analytes at a level greater than or equal to the laboratory's reporting limit. If contaminants at less than the laboratory's reporting limit are important to the project, BP Trace-Level Certification should be selected.

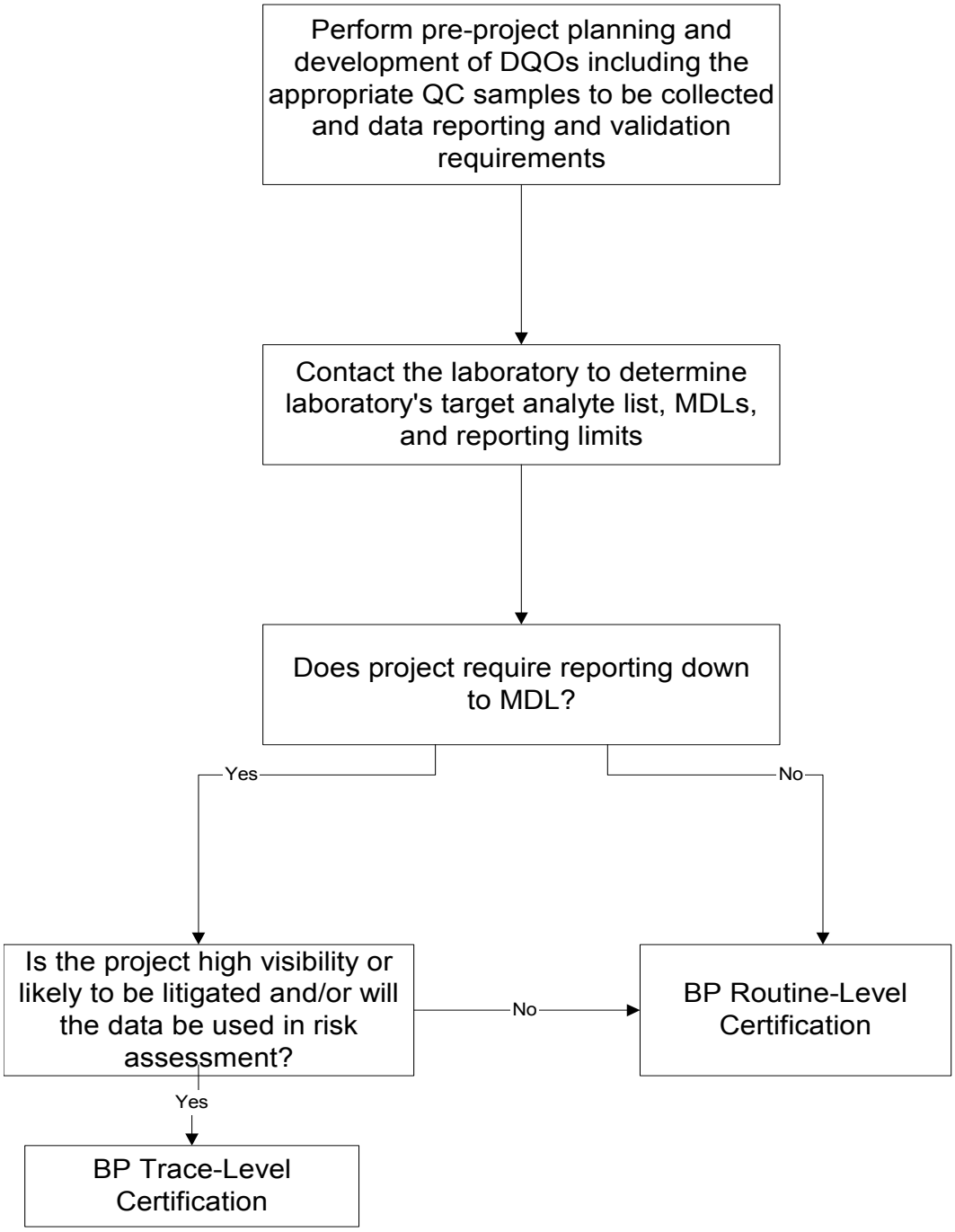
- Flow controllers that cannot meet BP Routine-Level Certification cleanliness requirements cannot be used for BP projects for which BP Routine-Level Certification is required.

- Once certified clean, the flow controller must be checked for leaks by connecting the flow controller to a pressurized gas line and using an electronic leak-checking device (or equivalent).

- Once the flow controller is verified to be leak-free, the flow controller should be tagged and is ready for use.

- Accurate laboratory records must be maintained on each flow controller and include (but not be limited to) an historical record of all previous flow controller usage, the cleaning documentation, and the certification data.

Figure 1
Options For Summa® Canister Cleaning And Related Activities



APPENDIX B

RECOMMENDED PROCEDURES FOR SOLID SAMPLE COLLECTION, STORAGE, PRESERVATION, AND ANALYSIS FOR VOLATILE ORGANIC COMPOUND ANALYSES

Significant confusion continues to exist regarding the appropriate collection, storage, preservation, and analysis techniques for solid samples for volatile organic compound (VOC analyses). The information provided herein is applicable to GC and GC/MS analyses for low-level VOCs (including oxygenates) in soil and solid wastes (*e.g.*, TCL VOCs, BTEX, GRO).

BACKGROUND OF SW-846 VOLATILE ORGANIC SOLID SAMPLING METHODOLOGIES

Prior to June 1997, SW-846 Methods 5030 and 5030A included specifications for the types of bottles, preservation, and storage of solid samples for low-level VOC analysis. These methods allowed solid samples to be collected in 4-ounce, wide-mouth jars and sample chemical preservation was not required. Method 5030 required analysis of solid samples within 14 days from collection.

In June 1997, the US EPA issued SW-846 Method 5035. This method was very different from any previous method because it contained field-sampling requirements for solid samples collected for VOC analysis. In particular, Method 5035 requires very specific sampling vessels to be used and requires preservation of solid samples within 48 hours from collection and analysis within a 14-day collection-to-analysis holding time. To be clear, Method 5030 has been deleted from SW-846, and Method 5030 does not include procedures for low-level VOC analyses of soil samples. Furthermore, Method 5035 (and its more recent version, Method 5035A) eliminated the allowance for solid samples to be stored in 4-ounce, wide-mouth containers or other similar storage devices, such as brass sleeves.

Inconsistent adoption of the Method 5035 requirements by federal, state, and local agencies has created significant confusion as to how and when Method 5030, Method 5030A, or Method 5035A should be requested by consultants and laboratories. Some consultants and laboratories continue to follow the techniques performed by Methods 5030 and 5030A while others have adopted Method 5035A sampling, preservation, and analysis requirements.

RECOMMENDATIONS

First and foremost, laboratories and Project Managers must comply with all requirements set forth by applicable state or federal regulatory agencies. Examples include, but are not limited to, the following scenarios.

- When a regulatory agency-approved, site-specific QAPP/SAP specifies the use of 4-ounce, wide-mouth containers or other similar storage devices (such as brass

sleeves) with a 14-day holding time, consultants and laboratories should continue to follow the applicable site-specific QAPP/SAP.

    - The laboratory must reference (and cite) Method 5030 in the analytical reports for this scenario.

- When a state-specific analytical method (*e.g.,* Texas 1005, Alaska 101, New Jersey methanol) is used in the state of origin, consultants and laboratories should continue to follow those methods but should monitor new regulations for applicable changes.

    - The laboratory must reference (and cite) the state-specific methods in the analytical reports for this scenario.

In the absence of requirements set forth by applicable state or federal regulatory agencies, the following options are available for the collection of solid samples for VOC analyses.

- Solid samples may be collected in En Core® samplers. The entire temporary storage vessel should be shipped to the laboratory and the laboratory must proceed as indicated in Exhibit A.

    - The laboratory must reference (and cite) Method 5035A in the analytical reports when this option has been followed.

- Solid samples may be collected using TerraCore® syringes and placed into three pre-weighed VOA vials (provided by the laboratory). The laboratory-provided, tared VOA vials can contain either a stir bar only, deionized water and a stir bar, sodium bisulfate and a stir bar, or methanol. Note that the use of sodium bisulfate is generally not recommended due to potential effervescence that may volatilize contaminants. The laboratory must proceed as indicated in Exhibit B.

    - The laboratory must reference (and cite) Method 5035A in the analytical reports when this option has been followed.

- Solid samples received in 4-ounce, wide-mouth containers or similar sampling devices (such as brass sleeves) must be preserved within 48 hours from collection. The laboratory preservation options for samples received in these containers are described in Exhibit C.

    - The laboratory must reference (and cite) Method 5035A (modified) in the analytical reports when this option has been followed. The modification must be defined as follows: “The sample was received in a vessel that is not stipulated in Method 5035A; however, the sample was preserved and/or analyzed within 48 hours of sample collection.” When the sample is not received within 48 hours of sample collection, Method 5030 must be cited.

Specific requests for sample containers compliant with Method 5035A will be provided by BP personnel or designated contractor. Note that in ALL cases, regardless of the method option used, a separate soil sample must be collected in a 4-ounce container from each sample location for shipment to the laboratory for the sole purpose of percent solids determination.

EXHIBIT A: LABORATORY OPTIONS FOR THE PRESERVATION OF SOLID SAMPLES RECEIVED IN EN CORE® SAMPLERS *

- The En Core sampler may be frozen within 48 hours from collection, and the sample must be analyzed within 14 days from collection.
- The laboratory may extrude 5 grams of solid sample into a 40-mL VOA vial containing a stir bar within 48 hours from collection and freeze the sample. The sample must be analyzed within 14 days from collection.
- The laboratory may extrude 5 grams of solid sample into a 40-mL VOA vial containing 10 mL of deionized water and a stir bar within 48 hours from collection and freeze the sample. The sample must be analyzed within 14 days from collection.
- The laboratory may extrude the solid sample into methanol and extract the sample with methanol within 48 hours from collection. The sample must be analyzed within 14 days from collection.
- The laboratory may extrude 5 grams of solid sample into a 40-mL VOA vial containing 10 mL of deionized water and a stir bar and analyze the sample within 48 hours from collection.

*** - Note that En Core samplers represent the** *most expensive option* **for executing Method 5035A.**

EXHIBIT B: Field Preservation of Solid Samples Using TerraCore® Syringes or Equivalent

The field preservation options using laboratory-provided tared 40-mL VOA vials and TerraCore syringes (or equivalent) are as follow.

- Using TerraCore syringes, measure about 5 grams of solid sample into each of three tared 40-mL VOA vials containing a stir bar.
- Using TerraCore syringes, measure about 5 grams of solid sample into each of two tared 40-mL VOA vials containing deionized water and a stir bar and one tared 40-mL VOA vial containing methanol.
- Using TerraCore syringes, measure about 5 grams of solid sample into each of two tared 40-mL VOA vials containing sodium bisulfate and a stir bar and one tared 40-mL VOA vials containing methanol.
- Using TerraCore syringes, measure about 5 grams of solid sample into each of three pre-weighed methanol jars.

Laboratory Options for Preservation of Solid Samples Received in 40-mL VOA Vials Containing a Stir Bar (Without Water)

- The laboratory may freeze the sample within 48 hours from collection. The sample must be analyzed (after injecting 10 mL of deionized water through the vial septum) within 14 days from collection.

- The laboratory may inject 10 mL of methanol through the vial septum and extract the sample with methanol within 48 hours from collection. The sample must be analyzed within 14 days from collection.

- The laboratory may inject 10 mL of deionized water through the vial septum and analyze the sample within 48 hours.

Laboratory Options for the Preservation of Solid Samples Received in 40-mL VOA Vials Containing Deionized Water and a Stir Bar

- The laboratory may freeze the sample within 48 hours from collection. The sample must be analyzed within 14 days from collection.

- The laboratory may analyze the sample within 48 hours from collection.

Field-preserved solid samples (*i.e.*, samples received in a 40-mL VOA vial with sodium bisulfate or in pre-weighed methanol jars) must be analyzed within 14 days from collection.

EXHIBIT C: Bottleware or Method 5030/5030A Sample Storage Vessels Used

- Within 48 hours of collection, the laboratory may quickly transfer 5 grams of the solid sample into one or more 40-mL VOA vials containing a stir bar and freeze the sample. Sample must be analyzed within 14 days of collection.

- Within 48 hours of collection, the laboratory may quickly transfer 5 grams of the solid sample into one or more 40-mL VOA vials containing 10 mL of deionized water and a stir bar and freeze the sample. Sample must be analyzed within 14 days of collection.

- Within 48 hours of collection, the laboratory may quickly transfer 5 grams of the solid sample into one or more 40-mL VOA vials containing 10 mL of sodium bisulfate and a stir bar. Sample must be analyzed within 14 days of collection.

- Within 48 hours of collection, the laboratory may quickly extract the sample with methanol. Sample must be analyzed within 14 days of collection.

- The laboratory may quickly transfer 5 grams of the sample into a 40-mL VOA vial containing 10 mL of deionized water and a stir bar and analyze the sample within 48 hours from collection. Sample must be analyzed within 14 days of collection.

APPENDIX C

DATA PACKAGE DELIVERABLE REQUIREMENTS

1.0 Introduction

The following sections describe in detail the types of data packages designed for BP projects. These details are provided to all BP LaMP laboratories to produce data packages that are similar in format, order of presentation, and content. Project-specific analysis requirements will indicate if the laboratory is required to report the results of library searches for tentatively identified compounds (TICs) in the GC/MS analyses. For projects that do not require TIC searches, the deliverables specified in Sections 2.1 and 2.3 for TICs will not be required.

BP data package deliverables are categorized into two levels as follows:

Full	-	See Section 2.0
Limited	-	See Section 3.0

State-specific data deliverables (*e.g.*, Texas TRRP or New Jersey Tier deliverables) may be requested on a project-specific basis.

Electronic data deliverables (EDD) must be provided for all data package deliverables via the format required for the project. In addition, indexed, thumb-nailed Portable Document Format (PDF) files of all data packages must be provided.

The laboratory is required to submit supporting documentation for the reported analytical results. The supporting documentation and the analytical results are required to be reported in one of the data package delivery categories listed above (defined below). The data package deliverables must be submitted in the order in which the deliverables appear in the text. The laboratory need not include the documentation for any fraction not required for a sample delivery group (SDG).

The laboratory is responsible for ensuring that all electronic and hardcopy data deliverables are in parity, including but not limited to significant figures, analyte names, and any qualifiers and/or footnotes used. All electronic data and hardcopy data deliverables are the property of BP and must be maintained for a minimum of five years. Under no circumstances is the laboratory to discard, dispose of, alter, or destroy any electronic data or hardcopy data deliverables without the express written consent of BP. In certain cases, state, federal or other regulatory agencies require that the data packages meet certain specific reporting formats. The laboratory is responsible for presenting the laboratory data to meet these regulatory program requirements with prior written notification by BP or its designated representative.

Prior to issuance to the client, all data must undergo at least an initial technical review by a trained analyst and a second technical review by a supervisor or another trained analyst.

2.0 General Format for Full Data Package Deliverables

For some analyses, BP Full Data Package deliverables may be requested instead of BP Limited Data Package deliverables. A Full Data Package will also be required with the Limited package as a summary package. The Full data package described below is equivalent to a CLP-compliant data package, which may be requested on a project-specific basis.

The Full Sample Data Package will include data for analyses of all samples in one SDG, including field samples, re-analyses, secondary dilutions, blanks, laboratory control samples, laboratory control sample duplicates, matrix spikes, matrix spike duplicates, and/or laboratory duplicates. As indicated in Section 3.1.1, the laboratory will report one single set of data representing the best of results for each sample (see Table 2 for guidance). The Full Data Package is divided into up to eight sections, as described below. Sections 2.1 through 2.8 are each specific to an analytical fraction. A fraction-specific unit is not a required deliverable if the analysis of that fraction was not required for samples in the SDG. The Full Data Package must be complete before submission and must be consecutively paginated. The Full Data Package will be arranged in the following order:

- Cover Letter/Letter of Transmittal signed by Technical Project Manager or designee
- Title Page
- Table of Contents
- SDG Narrative signed by Technical Project Manager or designee [The SDG Narrative must include a statement or statements relative to compliance with this document and any applicable Quality Assurance Project Plan (QAPP) or Work Plan (WP) and description of any deviations.]
- References to preparation and analytical methods performed and applicable project documents (*i.e.*, QAPP)
- Field and Internal Laboratory Chain-of-Custody Records
    - Sample Receipt Information
    - Project Correspondence
- For each analytical method and matrix included in the SDG, the laboratory must provide the summary of the full MDL study (seven replicates, standard concentrations, *etc.*) and the annual single point confirmation data, as applicable.

2.1 GC/MS Volatile Organic Results and Quality Control

A. Quality Control (QC) Summary

- Surrogate Percent Recovery Summary that must include the following:
    - SDG number
    - BP sample number
    - Method blank sample number
    - MS sample number
    - MSD sample number
    - LCS identification number
    - LCSD identification number (if performed)
    - matrix of the summarized samples
    - percent recovery for all surrogate compounds
    - applicable recovery limits for each surrogate compound
- MS/MSD Summary that must include the following:
    - SDG number
    - matrix of the summarized samples
    - BP sample number of the non-spiked aliquot
    - analysis file numbers for the MS and MSD analyses
    - names of the compounds included in the MS solution
    - true concentrations and concentration units for each compound in the MS and MSD
    - observed compound concentration and concentration units in the non-spiked aliquot
    - observed compound concentration and concentration units in the MS aliquot

- observed compound concentration and concentration units in the MSD aliquot
- percent recovery for each compound
- relative percent difference (RPD) between the MS/MSD results
- recovery limits for each compound
- RPD limit for each compound

- LCS Summary, which must include the following:
  - SDG number
  - LCS matrix
  - LCS identifier
  - analysis file number
  - LCS solution lot number
  - names of the compounds included in the LCS solution
  - true concentrations and concentration units for each compound in the LCS
  - observed compound concentrations and concentration units
  - percent recovery for each compound
  - recovery limits for each compound

If an LCSD is performed, the LCS Summary must also include:

- LCSD identifier
- observed concentration for each LCSD compound
- percent recovery for each compound
- RPD between the LCS/LCSD results
- RPD limit for each compound

- Method Blank Summary: The Method Blank Summaries will be arranged in chronological order by date of analysis of the blank, by instrument and must include the following:

    - SDG number
    - matrix of summarized samples
    - method blank identifier
    - analysis file number for the method blank
    - date and time of method blank analysis
    - instrument identifier
    - BP sample numbers associated with the method blank
    - analysis file number for each associated BP sample

- GC/MS Tuning and Mass Calibration Summary: The tuning summaries will be arranged in chronological order, by instrument and must include the following:

    - SDG number
    - matrix of the summarized samples
    - tuning injection file number
    - tuning inject date and time of analysis
    - instrument identifier
    - percent relative abundance for each required mass ion
    - acceptance criteria for each relative abundance
    - identifier for each associated QC sample
    - each associated BP sample number
    - analysis file number, date, and time for each associated QC and BP sample analysis

- Initial Calibration Summary: The initial calibration summaries will be arranged in chronological order, by instrument and must include the following:

    - SDG number
    - start and end dates and times of the initial calibration
    - analysis file numbers for all initial calibration analyses
    - instrument identifier
    - compound names for all target compounds and surrogates
    - relative response factors (RRFs) for each initial calibration standard performed
    - average RRF for each target compound and surrogate
    - percent relative standard deviation (%RSD) for each target compound and surrogate
    - calibration curve equation and curve plot for each target compound and surrogate (if applicable)

- Initial Calibration Verification (ICV) Summary: The ICV summaries will be arranged in chronological order, by instrument and must include the following:

    - SDG number
    - start and end dates and times of associated initial calibration
    - analysis date and time of ICV standard
    - analysis file number of the ICV analysis
    - instrument identifier
    - compound names for all target compounds and surrogates
    - initial calibration average RRF or true concentration for each target compound and surrogate
    - observed ICV standard RRF or concentration for each target compound and surrogate

- percent difference or percent drift for each target compound and surrogate
- acceptance criteria for each compound

- Continuing Calibration Verification (CCV) Summary: The CCV summaries will be arranged in chronological order, by instrument and must include the following:
  - SDG number
  - start and end dates and times of associated initial calibration
  - analysis date and time of CCV standard
  - analysis file number of the CCV analysis
  - instrument identifier
  - compound names for all target compounds and surrogates
  - initial calibration average RRF or true concentration for each target compound and surrogate
  - observed continuing calibration standard RRF or concentration for each target compound and surrogate
  - percent difference or percent drift for each target compound and surrogate
- Internal Standard Area and Retention Time Summary: The internal standard summary will be arranged in chronological order, by instrument and must include the following:
  - SDG number
  - CCV standard file number
  - CCV standard date and time of analysis
  - instrument identifier
  - compound name for each internal standard
  - observed area and retention time for each internal standard in the CCV standard

- project samples and QC sample areas and retention times must be compared to the associated CCV standard

- CCV standard areas and retention times must be compared to the midpoint standard of the associated initial calibration

- upper acceptance limit for the area and retention time for each internal standard
- lower acceptance limit for the area and retention time for each internal standard
- observed area and retention time for each internal standard from the mid-point standard of the associated initial calibration.
- each associated BP sample number
- observed area and retention time for each internal standard for associated BP sample
- identifier for each associated QC sample
- observed area and retention time for each internal standard for associated QC sample

B. Sample Data

Sample data shall be arranged in individual sample packets (consisting of the Target Compound Analytical Results Summaries followed by the raw data for volatile samples) that must be placed in increasing alphanumeric order by laboratory sample number. The order of each sample packet is as follows:

- Target Compound Analytical Results Summary that must include the following:
  - SDG number
  - BP sample number
  - laboratory sample identifier
  - matrix of the BP sample
  - date of sample collection
  - date of analysis

- analysis file number
- sample weight or volume used for analysis
- sample percent solid content
- final extract sample volume
- extract aliquot volume used for analysis
- dilution factor
- name and Chemical Abstract Service (CAS) number for each target compound
- concentration of positive results and project-required quantitation limit and/or MDL for each target compound
- any applicable flags for target compound results (*e.g.*, "U" to designate a "not-detected" result)
- concentration units

- Tentatively Identified Compound (TIC) Analytical Results Summary (if applicable) that must include the following:
  - SDG number
  - BP sample number
  - laboratory sample identifier
  - matrix of the BP sample
  - date of sample collection
  - date of analysis
  - analysis file number
  - sample weight or volume used for analysis
  - sample percent solid content
  - final extract sample volume

- extract aliquot volume used for analysis
- dilution factor
- name and CAS number (if applicable) for each TIC
- concentration for each TIC
- any applicable flags for TIC results (*e.g.*, “N” to designate a tentatively identified compound name)
- concentration units

- Reconstructed total ion chromatogram (RIC) and quantitation report (including initial and re-integrations for manually-integrated data)

- Copies of raw spectra and copies of background-subtracted mass spectrum of each target compound identified in the sample and corresponding background-subtracted target compound standard mass spectrum

- Quantitation/Calculation of TIC concentrations (if applicable)

- Copies of up to 10 non-surrogate and non-internal standard volatile TICs and the associated best-match spectra (best three matches) from the GC/MS library search for each TIC (if requested)

C. Standards Data

- Copies of RIC and quantitation report (including initial and re-integrations for manually-integrated data) for each initial calibration standard associated with analyses in the SDG, in chronological order, by instrument

- Copies of RIC and quantitation report (including initial and re-integrations for manually-integrated data) for each ICV standard associated with analyses in the SDG, in chronological order, by instrument

- Copies of RIC and quantitation report (including initial and re-integrations for manually-integrated data) for each CCV standard associated with analyses in the SDG, in chronological order, by instrument

D. Raw QC Data

- For each GC/MS tuning and mass calibration arranged in chronological order, by instrument:

- Bromofluorobenzene (BFB) bar graph spectrum
- BFB mass listing

- Blank Data (including instrument/solvent blank data) arranged in chronological order, by instrument:
  - Target Compound Analytical Results Summary (as previously defined)
  - TIC Analytical Results Summary (if applicable, as previously defined)
  - RIC and quantitation reports (including initial and re-integrations for manually-integrated data)
  - Copies of raw spectra and copies of background-subtracted mass spectra of each target compound identified in the blank and corresponding background-subtracted target compound standard mass spectra
  - Quantitation/Calculation of TIC concentrations (if applicable)
  - Copies of mass spectra of non-surrogate and non-internal standard volatile tentatively identified compounds (TICs) and the associated best-match spectra (best three matches) from the GC/MS library search for each TIC (if requested)
- LCS Data
  - Target Compound Analytical Results Summary (as previously defined)
  - RIC and quantitation reports (including initial and re-integrations for manually-integrated data)
- LCSD Data (if performed)
  - Target Compound Analytical Results Summary (as previously defined)
  - RIC and quantitation reports (including initial and re-integrations for manually-integrated data)

- MS Data

    - Target Compound Analytical Results Summary (as previously defined)

    - RIC and quantitation reports (including initial and re-integrations for manually-integrated data)

- MSD Data

    - Target Compound Analytical Results Summary (as previously defined)

    - RIC and quantitation reports (including initial and re-integrations for manually-integrated data)

E. Preparation Logs

- Toxicity Characteristic Leaching Procedure (TCLP) or Synthetic Precipitation leaching procedure (SPLP) Extraction Logs (if performed)

- Volatile Medium-Level (Methanol) Extraction Logs (if performed)

- Volatile Low-Level (En Core®) Sample Preparation Logs (if performed)

- Volatile Sample pH Logs (aqueous samples only)

2.2 GC Volatile Organic Results and QC

A. QC Summary

- Surrogate Percent Recovery Summary that must include the following:

    - SDG number

    - BP sample number

    - Method blank sample number

    - MS sample number

    - MSD sample number

    - LCS identification number

    - LCSD identification number (if performed)

- matrix of the summarized samples
- percent recovery for all surrogate compounds
- applicable recovery limits for each surrogate compound

- MS/MSD Summary that must include the following:
  - SDG number
  - matrix of the summarized samples
  - analysis file numbers for the MS and MSD analyses
  - BP sample number of the non-spiked aliquot
  - names of the compounds included in the MS solution
  - true concentrations and concentration units for each compound in the MS and MSD
  - observed compound concentration and concentration units in the non-spiked aliquot
  - observed compound concentration and concentration units in the MS aliquot
  - observed compound concentration and concentration units in the MSD aliquot
  - percent recovery for each compound
  - RPD between the MS/MSD results
  - recovery limits for each compound
  - RPD limit for each compound
- LCS Summary, which must include the following:
  - SDG number
  - LCS matrix
  - LCS identifier

- analysis file number
- LCS solution lot number
- names of the compounds included in the LCS solution
- true concentrations and concentration units for each compound in the LCS
- observed compound concentrations and concentration units
- percent recovery for each compound
- recovery limits for each compound

If an LCSD is performed, the LCS Summary must also include:

- LCSD identifier
- observed concentration for each LCSD compound
- percent recovery for each compound
- RPD between the LCS/LCSD results
- RPD limit for each compound

- Method Blank Summary: The Method Blank Summaries will be arranged in chronological order by date of analysis of the blank, by instrument and must include the following:

  - SDG number
  - matrix of summarized samples
  - method blank identifier
  - analysis file number for the method blank
  - date and time of method blank analysis
  - instrument identifier
  - BP sample numbers associated with the method blank

- analysis file number for each associated BP sample

- Initial Calibration Summary: The initial calibration summaries will be arranged in chronological order, by instrument and must include the following:

    - SDG number
    - start and end dates and times of the initial calibration
    - analysis file numbers for all initial calibration analyses
    - instrument identifier
    - compound names for all target compounds and surrogates
    - RRFs or response factor (RF) for each initial calibration standard performed
    - average RRF or average RF for each target compound and surrogate
    - %RSD for each target compound and surrogate
    - calibration curve equation and curve plot for each target compound and surrogate (if applicable)

- Initial Calibration Verification (ICV) Summary: The ICV summaries will be arranged in chronological order, by instrument and must include the following:

    - SDG number
    - start and end dates and times of associated initial calibration
    - analysis date and time of ICV standard
    - analysis file number of the ICV analysis
    - instrument identifier
    - compound names for all target compounds and surrogates
    - initial calibration average RRF, average RF, or true concentration for each target compound and surrogate

- observed ICV standard RRF or RF or concentration for each target compound and surrogate
- percent difference or percent drift for each target compound and surrogate
- acceptance criteria for ICV standard

- Continuing Calibration Verification (CCV) Summary: The CCV summaries will be arranged in chronological order, by instrument and must include the following:
  - SDG number
  - start and end dates and times of associated initial calibration
  - analysis date and time of CCV standard
  - analysis file number of the CCV analysis
  - instrument identifier
  - compound names for all target compounds and surrogates
  - initial calibration average RRF, average RF or true concentration for each target compound and surrogate
  - observed continuing calibration standard RRF or RF or concentration for each target compound and surrogate
  - percent difference or percent drift for each target compound and surrogate
- Internal Standard Area and Retention Time Summary (if applicable): The internal standard summary will be arranged in chronological order, by instrument and must include the following:
  - SDG number
  - CCV standard file number
  - CCV standard date and time of analysis
  - instrument identifier
  - compound name for each internal standard

- observed area and retention time for each internal standard in the CCV standard
  - project samples and QC sample areas and retention times must be compared to the associated CCV standard
  - CCV standard areas and retention times must be compared to the midpoint standard of the associated initial calibration
- upper acceptance limit for the area and retention time for each internal standard
- lower acceptance limit for the area and retention time for each internal standard
- observed area and retention time for each internal standard from the mid-point standard of the associated initial calibration.
- each associated BP sample number
- observed area and retention time for each internal standard for associated BP sample
- identifier for each associated QC sample
- observed area and retention time for each internal standard for associated QC sample

B. Sample Data

Sample data will be arranged in individual sample packets (consisting of the Target Compound Analytical Results Summaries followed by the raw data for volatile samples) that must be placed in increasing alphanumeric order by BP sample number. The order of each sample packet is as follows:

- Target Compound Analytical Results Summary that must include the following:
  - SDG number
  - BP sample number
  - laboratory sample identifier
  - matrix of the BP sample
  - date of sample collection

- date of analysis
- analysis file number
- sample weight or volume used for analysis
- sample percent solid content
- final extract sample volume
- extract aliquot volume used for analysis
- dilution factor
- name and CAS number for each target compound
- concentration of positives, PRQL and/or MDL for each target compound
- any applicable flags for target compound results (e.g., “U” to designate a “not-detected” result)
- concentration units

- Copies of volatile chromatograms (including initial and re-integrations for manually-integrated data)

- Copies of volatile chromatograms (including initial and re-integrations for manually-integrated data) from second gas chromatograph (GC) column confirmation (if performed)

- GC integration reports or data system printouts. All peaks must be included on the integration reports or data system printouts.

- Manual work sheets (including example calculation showing how sample results are calculated using initial calibration standard peak areas/heights and sample peak areas/heights for at least one sample)

C. Standards Data

- Analytical Sequence Form: The analytical sequence forms will be arranged in chronological order, by GC column, by instrument and must include the following:
    - SDG Number

- instrument identifier

- BP sample numbers associated with the sequence
- QC sample identifiers associated with the sequence

- analysis file number, date, and time for each BP sample and QC sample associated with the sequence

- initial calibration start and end dates and times associated with the sequence

- Copies of chromatogram and integration report (including initial and re-integrations for manually-integrated data) for each initial calibration standard associated with SDG in chronological order, by GC column, by instrument

- Copies of chromatogram and integration report (including initial and re-integrations for manually-integrated data) for each ICV standard associated with SDG in chronological order, by GC column, by instrument following the associated initial calibration standards data

- Copies of chromatogram and integration report (including initial and re-integrations for manually-integrated data) for each CCV associated with SDG in chronological order, by GC column, by instrument following the associated initial calibration standards data

D. Raw QC Data

- Blank Data (including instrument/solvent blank data) arranged in chronological order, by instrument

    - Target Compound Analytical Results Summary (as previously defined)

    - chromatograms and integration reports (including initial and re-integrations for manually-integrated data). All peaks must be included on the integration reports or data system printouts.

- LCS Data

    - Target Compound Analytical Results Summary (as previously defined)

    - chromatograms and integration reports(including initial and re-integrations for manually-integrated data)

- LCSD Data (if performed)

    - Target Compound Analytical Results Summary (as previously defined)
    - chromatograms and integration reports(including initial and re-integrations for manually-integrated data)

- MS Data

    - Target Compound Analytical Results Summary (as previously defined)

    - chromatograms and integration reports(including initial and re-integrations for manually-integrated data)

- MSD Data

    - Target Compound Analytical Results Summary (as previously defined)

    - chromatograms and integration reports(including initial and re-integrations for manually-integrated data)

E. Preparation Logs

- TCLP or SPLP Extraction Logs (if performed)

- Volatile Medium-Level (methanol) Extraction Logs (if performed)

- Volatile Low-Level (En Core®) Sample Preparation Logs (if performed)

- Volatile sample pH logs (aqueous samples only)

2.3 GC/MS Semivolatile Organic Results and QC

A. QC Summary

- Surrogate Percent Recovery Summary that must include the following:

    - SDG number

    - BP sample number

    - Method blank sample number

    - MS sample number

- MSD sample number
- LCS identification number
- LCSD identification number (if performed)
- matrix of the summarized samples
- percent recovery for all surrogate compounds
- applicable recovery limits for each surrogate compound

- MS/MSD Summary that must include the following:
  - SDG number
  - matrix of the summarized samples
  - BP sample number of the non-spiked aliquot
  - analysis file numbers for the MS and MSD analyses
  - names of the compounds included in the MS solution
  - true concentrations and concentration units for each compound in the MS and MSD
  - observed compound concentration and concentration units in the non-spiked aliquot
  - observed compound concentration and concentration units in the MS aliquot
  - observed compound concentration and concentration units in the MSD aliquot
  - percent recovery for each compound
  - RPD between the MS/MSD results
  - recovery limits for each compound
  - RPD limit for each compound
- LCS Summary that must include the following:

- SDG number
- LCS matrix
- LCS identifier
- LCS solution lot number
- analysis file number
- names of the compounds included in the LCS solution
- true concentrations and concentration units for each compound in the LCS
- observed compound concentrations and concentration units
- percent recovery for each compound
- recovery limits for each compound

If an LCSD is performed, the LCS Summary must also include:

- LCSD identifier
- observed concentration for each LCSD compound
- percent recovery for each compound
- RPD between the LCS/LCSD results
- RPD limit for each compound

- Method Blank Summary: The Method Blank Summaries will be arranged in chronological order by date of analysis of the blank, by instrument and must include the following:

  - SDG number
  - matrix of summarized samples
  - method blank identifier
  - date and time of method blank analysis
  - instrument identifier

- BP sample numbers and QC sample identifiers associated with the method blank
- analysis file number for each associated BP sample and QC sample
- indication if and what type of sample clean-up was performed.

- GC/MS Tuning and Mass Calibration Summary: The tuning summaries will be arranged in chronological order, by instrument and must include the following:
  - SDG number
  - matrix of the summarized samples
  - tuning injection file number
  - tuning inject date and time of analysis
  - instrument identifier
  - percent relative abundance for each required mass ion
  - acceptance criteria for each relative abundance
  - identifier for each associated QC sample
  - each associated BP sample number
  - analysis file number, date, and time for each associated QC and BP sample analysis
- Initial Calibration Summary: The initial calibration summaries will be arranged in chronological order, by instrument and must include the following:
  - SDG number
  - start and end dates and times of the initial calibration
  - analysis file numbers for all initial calibration analyses
  - instrument identifier

- compound names for all target compounds and surrogates
- RRFs for each initial calibration standard performed
- average RRF for each target compound and surrogate
- %RSD for each target compound and surrogate
- calibration curve equation and curve plot for each target compound and surrogate (if applicable)

- Initial Calibration Verification (ICV) Summary: The ICV summaries will be arranged in chronological order, by instrument and must include the following:
  - SDG number
  - start and end dates and times of associated initial calibration
  - analysis date and time of ICV standard
  - analysis file number of the ICV analysis
  - instrument identifier
  - compound names for all target compounds and surrogates
  - initial calibration average RRF, average RF, or true concentration for each target compound and surrogate
  - observed ICV standard RRF or RF or concentration for each target compound and surrogate
  - percent difference or percent drift for each target compound and surrogate
  - acceptance criteria for ICV standard
- Continuing Calibration Verification (CCV) Summary: The CCV summaries will be arranged in chronological order, by instrument and must include the following:
  - SDG number
  - start and end dates and times of associated initial calibration

- analysis date and time of CCV standard
- analysis file number of the CCV analysis
- instrument identifier
- compound names for all target compounds and surrogates
- initial calibration average RRF, average RF, or true concentration for each target compound and surrogate
- observed continuing calibration standard RRF or RF or concentration for each target compound and surrogate
- percent difference or percent drift for each target compound and surrogate

- Internal Standard Area and Retention Time Summary: The internal standard summaries will be arranged in chronological order, by instrument and must include the following:
  - SDG number
  - CCV standard file number
  - CCV standard date and time of analysis
  - instrument identifier
  - compound name for each internal standard
  - observed area and retention time for each internal standard in the CCV standard
    - project samples and QC sample areas and retention times must be compared to the associated CCV standard
    - CCV standard areas and retention times must be compared to the midpoint standard of the associated initial calibration
  - upper acceptance limit for the area and retention time for each internal standard
  - lower acceptance limit for the area and retention time for each internal standard

- observed area and retention time for each internal standard from the mid-point standard of the associated initial calibration.
- each associated BP sample number
- observed area and retention time for each internal standard for associated BP sample
- identifier for each associated QC sample
- observed area and retention time for each internal standard for associated QC sample

B. Sample Data

Sample data will be arranged in individual sample packets (consisting of the Target Compound Analytical Results Summaries, followed by the raw data for semivolatile samples) that must be placed in increasing alphanumeric order by laboratory sample number. The order of each sample packet is as follows:

- Target Compound Analytical Results Summary that must include the following:
  - SDG number
  - BP sample number
  - laboratory sample identifier
  - matrix of the BP sample
  - date of sample collection
  - date of sample extraction
  - date of sample analysis
  - analysis file number
  - sample with or volume used for extraction with units
  - sample percent solids
  - sample final extract volume with units
  - sample extract injection volume with units

- dilution factor
- indication if and what type of sample cleanup was performed
- name and CAS number for each target compound
- concentration of positives and PRQL and/or MDL for each target compound
- any applicable flags for target compound results (*e.g.*, “U” to designate a “not-detected” result)
- concentration units

- TIC Analytical Results Summary (if applicable) that must include the following:
  - SDG number
  - BP sample number
  - laboratory sample identifier
  - matrix of the BP sample
  - date of sample collection
  - date of sample extraction
  - date of sample analysis
  - analysis file number
  - sample with or volume used for extraction with units
  - sample percent solids
  - sample final extract volume with units
  - sample extract injection volume with units
  - dilution factor
  - indication if and what type of sample cleanup was performed

- name and CAS number (if applicable) for each TIC
- concentration for each TIC
- any applicable flags for TIC results (*e.g.*, "N" to designate a tentatively identified compound name)
- concentration units

- RIC and quantitation report (including initial and re-integrations for manually-integrated data)

- Copies of raw spectra and copies of background-subtracted mass spectra of each target compound identified in the sample and corresponding background-subtracted target compound standard mass spectra

- Quantitation/Calculation of TIC concentrations (if applicable)

- Copies of mass spectra of up to 20 non-surrogate and non-internal standard semivolatile TICs and the associated best-match spectra (best three matches) from the GC/MS library search for each TIC (if requested)

- UV trace for GPC (if performed)

C. Standards Data

- Copies of RIC and quantitation report (including initial and re-integrations for manually-integrated data) for each initial calibration standard associated with analyses in the SDG, in chronological order, by instrument

- Copies of RIC and quantitation report (including initial and re-integrations for manually-integrated data) for each ICV standard associated with analyses in the SDG, in chronological order, by instrument

- Copies of RIC and quantitation report (including initial and re-integrations for manually-integrated data) for each CCV standard associated with analyses in the SDG, in chronological order, by instrument

D. Raw QC Data

- For each GC/MS tuning and mass calibration arranged in chronological order, by instrument:
  - Decafluorotriphenylphosphine (DFTPP) bar graph spectrum

- DFTPP mass listing

- Blank Data (including instrument/solvent blank data) arranged in chronological order, by instrument:

  - Target Compound Analytical Results Summary (as defined in Section 2.3.b)

  - TIC Analytical Results Summary (as defined in Section 2.3b)

  - RIC and quantitation reports (including initial and re-integrations for manually-integrated data)

  - Copies of raw spectra and copies of background-subtracted mass spectra of each target compounds identified in the blank and corresponding background-subtracted target compound standard mass spectra

  - Quantitation/Calculation of TIC concentrations (if applicable)

  - Copies of mass spectra of non-surrogate and non-internal standard semivolatile tentatively identified compounds (TICs) and the associated best-match spectra (best three matches) from the GC/MS library search for each TIC (if requested)

- LCS Data

  - Target Compound Analytical Results Summary (as previously defined)

  - RIC and quantitation reports (including initial and re-integrations for manually-integrated data)

- LCSD Data (if performed)

  - Target Compound Analytical Results Summary (as previously defined)

  - RIC and quantitation reports (including initial and re-integrations for manually-integrated data)

- MS Data

  - Target Compound Analytical Results Summary (as previously defined)

- RIC and quantitation reports (including initial and re-integrations for manually-integrated data)

- MSD Data

    - Target Compound Analytical Results Summary (as previously defined)

    - RIC and quantitation reports (including initial and re-integrations for manually-integrated data)

E. Preparation Logs

- TCLP or SPLP Extract Logs (if performed)

- Semivolatile Extraction Logs

2.4 GC Organochlorine Pesticide/PCB Results and QC

A. QC Summary

- Surrogate Percent Recovery Summary that must include the following:

    - SDG number

    - BP sample number

    - Method blank sample number

    - MS sample number

    - MSD sample number

    - LCS identifier

    - LCSD identification number (if performed)

    - matrix of the summarized samples

    - percent recovery for all surrogate compounds from both columns

    - applicable recovery limit for each surrogate compound

- MS/MSD Summary that must include the following:

    - SDG number

    - matrix of the summarized samples

- BP sample number of the non-spiked aliquot
- names of the compounds included in the MS solution
- true concentrations and concentration units for each compound in the MS and MSD
- observed compound concentration and concentration units in the non-spiked aliquot
- observed compound concentration and concentration units in the MS aliquot
- observed compound concentration and concentration units in the MSD aliquot
- percent recovery for each compound
- RPD between the MS/MSD results
- recovery limits for each compound
- RPD limits for each compound

- LCS Summary, which must include the following:

  - SDG number
  - LCS matrix
  - LCS identifier
  - LCS solution lot number
  - names of the compounds included in the LCS solution
  - true concentration and concentration units for each compound in the LCS
  - observed compound concentration and concentration units
  - percent recovery for each compound
  - recovery limits for each compound

If LCSD is performed, the summary must also include:

- LCSD identifier
- Observed concentration for each LCSD compound
- Percent recovery for each compound
- RPD between the LCS/LCSD results
- RPD limit for each compound

- Method Blank Summary: The Method Blank Summaries will be arranged in chronological order by date of analysis of the blank, by instrument and must include the following:
  - SDG number
  - matrix of summarized samples
  - method blank identifier
  - analysis file number for the method blank
  - date and time of method blank analysis
  - instrument identifier
  - column identifiers
  - BP sample numbers associated with the method blank
  - analysis file number for each associated BP sample.
  - an indication if and what type of sample clean-up was performed.
- Initial Calibration RRF or RF Summary: The initial calibration RRF or RF summaries will be arranged in chronological order, by instrument, by column, and must include the following:
  - SDG number
  - start and end dates and times of the initial calibration
  - file identifiers for all initial calibration analyses
  - instrument identifier

- column identifier
- compound names for all target compounds and surrogates
- RRFs or CFs for each initial calibration standard performed
- average RRF or CF for each target compound and surrogate
- %RSD for each target compound and surrogate
- calibration curve equation and curve plot for each target compound and surrogate (if applicable)

- Initial Calibration Retention Time Summary: The initial calibration retention time summaries will be arranged in chronological order, by instrument, by column, and must include the following:
  - SDG number
  - start and end dates and times of the initial calibration
  - file identifiers for all initial calibration analyses
  - instrument identifier
  - column identifier
  - compound names for all target compounds and surrogates
  - retention times for each initial calibration standard performed
  - average retention time for each target compound and surrogate
  - upper and lower retention time acceptance limits for each target compound and surrogate
- Initial Calibration Verification (ICV) Summary: The ICV summaries will be arranged in chronological order, by instrument, by column, and must include the following:
  - SDG number
  - start and end dates and times of associated initial calibration
  - analysis dated and time of ICV standard

- file number of the ICV analysis
- instrument identifier
- column identifier
- compound names for all target compounds and surrogates
- observed retention times for each target compound and surrogate
- initial calibration average RRF or CF or true concentration for each target compound and surrogate
- acceptance criteria for ICV standard

- Continuing Calibration Verification (CCV) Summary: The CCV summaries will be arranged in chronological order, by instrument, by column, and must include the following:
  - SDG number
  - start and end dates and times of associated initial calibration
  - analysis dated and time of CCV standard
  - file number of the CCV analysis
  - instrument identifier
  - column identifier
  - compound names for all target compounds and surrogates
  - observed retention times for each target compound and surrogate
  - initial calibration average RRF or CF or true concentration for each target compound and surrogate
  - observed CCV standard RRF or CF or concentration for each target compound and surrogate
  - percent difference or percent drift for each target compound and surrogate
  - percent breakdown for endrin and 4,4′-DDT

- Internal Standard Area and Retention Time Summary (if applicable): The internal standard summaries will be arranged in chronological order, by instrument, by column, and must include the following:

    - SDG number
    - CCV standard file number
    - CCV standard date and time of analysis
    - instrument identifier
    - column identifier
    - compound name for each internal standard
    - observed area and retention time for each internal standard in the CCV standard
        - project samples and QC sample areas and retention times must be compared to the associated CCV standard
        - CCV standard areas and retention times must be compared to the midpoint standard of the associated initial calibration
    - upper acceptance limit for the area and retention time for each internal standard
    - lower acceptance limit for the area and retention time for each internal standard
    - observed area and retention time for each internal standard from the midpoint standard of the associated initial calibration
    - each associated BP sample number
    - observed area and retention time for each internal standard for associated BP sample
    - identifier for each associated QC sample
    - observed area and retention time for each internal standard for associated QC sample

B. Sample Data

Sample data shall be arranged in individual sample packets (consisting of the Target Compound Analytical Results Summaries followed by the raw data for organochlorine pesticide/PCB samples) that must be placed in increasing alphanumeric order by laboratory sample number. The order of each sample packet is as follows:

- Target Compound Analytical Results Summary that must include the following:

    - SDG number
    - BP sample number
    - laboratory sample identifier
    - matrix of the BP sample
    - date of sample collection
    - date of sample extraction
    - date of sample analysis
    - analysis file number
    - sample with or volume used for extraction with units
    - sample percent solids
    - sample final extract volume with units
    - sample extract injection volume with units
    - dilution factor
    - indication if and what type of sample cleanup was performed
    - name and CAS number for each target compound
    - concentration of positives and PRQL and/or MDL for each target compound
    - any applicable flags for target compound results (*e.g.*, “U” to designate a “not-detected” result)

- concentration units

- Copies of organochlorine pesticide/PCB chromatograms

- Copies of organochlorine pesticide/PCB chromatograms from second GC column confirmation (if performed)

- RPD between concentrations on columns for positive results.

- GC integration reports or data system printouts (including initial and re-integrations for manually-integrated data). All peaks must be included on the integration reports or data system printouts.

- Manual work sheets (including example calculation showing how sample results are calculated using initial calibration standard peak areas/heights and sample peak areas/heights for at least one sample)

- UV traces from GPC (if performed)

- If organochlorine pesticides/PCBs are confirmed by GC/MS, the laboratory must submit copies of raw spectra and copies of background-subtracted mass spectra of target compounds that are identified in the sample and corresponding background-subtracted target compound standard mass spectra. For multi-component pesticides/PCBs confirmed by GC/MS, the laboratory must submit mass spectra of three major peaks of multi-component compounds from samples and standards

C. Standards Data

- Analytical Sequence Form: The analytical sequence forms will be arranged in chronological order, by GC column, by instrument, by column, and must include the following:

    - SDG number

    - instrument identifier

    - column identifier

    - BP sample numbers associated in the sequence

    - QC sample identifiers associated in the sequence

    - analysis file number, date, and time for each BP sample and QC sample associated in the sequence

- initial calibration start and end dates and times associated in the sequence

- Copies of chromatogram and integration report (including initial and re-integrations for manually-integrated data) for each initial calibration standard associated with SDG in chronological order, by column, by instrument

- Copies of chromatogram and integration report (including initial and re-integrations for manually-integrated data) for each ICV standard associated with SDG in chronological order, by column, by instrument following the associated initial calibration standards data

- Copies of chromatogram and integration report (including initial and re-integrations for manually-integrated data) for each CCV standard associated with SDG in chronological order, by column, by instrument following the associated initial calibration standards data

D. Raw QC Data

- Blank Data (including instrument/solvent blank data) arranged in chronological order, by instrument

    - Target Compound Analytical Results Summary (as previously defined)

    - chromatograms and integration reports (including initial and re-integrations for manually-integrated data). All peaks must be included on the integration reports or data system printouts.

- LCS Data

    - Target Compound Analytical Results Summary (as previously defined)

    - chromatograms and integration reports (including initial and re-integrations for manually-integrated data)

- LCSD Data (if performed)

    - Target Compound Analytical Results Summary (as previously defined)

    - chromatograms and integration reports (including initial and re-integrations for manually-integrated data)

- MS Data

    - Target Compound Analytical Results Summary (as previously defined)

    - chromatograms and integration reports (including initial and re-integrations for manually-integrated data)

- MSD Data

    - Target Compound Analytical Results Summary (as previously defined)

    - chromatograms and integration reports (including initial and re-integrations for manually-integrated data)

E. Preparation Logs

- TCLP or SPLP Extract Logs (if performed)

- Organochlorine Pesticide/PCB Extraction Logs

2.5 GC Herbicide Results and QC

A. QC Summary

- Surrogate Percent Recovery Summary, which must include the following:

    - SDG number

    - BP sample number

    - Method blank sample number

    - MS sample number

    - MSD sample number

    - LCS identifier

    - LCSD identification number (if performed)

    - matrix of the summarized samples

    - percent recovery for all surrogate compounds from both columns

- applicable recovery limit for each surrogate compound

- MS/MSD Summary that must include the following:
  - SDG number
  - matrix of the summarized samples
  - BP sample number of the non-spiked aliquot
  - names of the compounds included in the MS solution
  - true concentrations and concentration units for each compound in the MS and MSD
  - observed compound concentration and concentration units in the non-spiked aliquot
  - observed compound concentration and concentration units in the MS aliquot
  - observed compound concentration and concentration units in the MSD aliquot
  - percent recovery for each compound
  - RPD between the MS/MSD results
  - recovery limits for each compound
  - RPD limit for each compound
- LCS Summary that must include the following:
  - SDG number
  - LCS matrix
  - LCS identifier
  - LCS solution lot number
  - names of the compounds included in the LCS solution
  - true concentration and concentration units for each compound in the LCS

- observed compound concentration and concentration units
- percent recovery for each compound
- recovery limits for each compound

If LCSD is performed, the summary must also include:

- LCSD identifier
- observed concentration for each LCSD compound
- percent recovery for each compound
- RPD between LCS/LCSD results
- RPD limit for each compound

- Method Blank Summary: The Method Blank Summaries will be arranged in chronological order by date of analysis of the blank, by instrument and must include the following:

  - SDG number
  - matrix of summarized samples
  - method blank identifier
  - analysis file number for the method blank
  - date and time of method blank analysis
  - instrument identifier
  - column identifiers
  - BP sample numbers associated with the method blank
  - analysis file number for each associated BP sample.
  - indication if and what type of sample clean-up was performed.

- Initial Calibration RRF or RF Summary: The initial calibration RRF or CF summaries will be arranged in chronological order, by instrument, by column, and must include the following:

- SDG number
- start and end dates and times of the initial calibration
- file identifiers for all initial calibration analyses
- instrument identifier
- column identifier
- compound names for all target compounds and surrogates
- RRFs or RFs for each initial calibration standard performed
- average RRF or RF for each target compound and surrogate
- %RSD for each target compound and surrogate
- calibration curve equation and curve plot for each target compound and surrogate (if applicable)

- Initial Calibration Retention Time Summary: The initial calibration retention time summaries will be arranged in chronological order, by instrument, by column, and must include the following:

  - SDG number
  - start and end dates and times of the initial calibration
  - file identifiers for all initial calibration analyses
  - instrument identifier
  - column identifier
  - compound names for all target compounds and surrogates
  - retention times for each initial calibration standard performed
  - average retention time for each target compound and surrogate
  - upper and lower retention time acceptance limits for each target compound and surrogate

- Initial Calibration Verification (ICV) Summary: The ICV summaries will be arranged in chronological order, by instrument, by column, and must include the following:

    - SDG number
    - start and end dates and times of associated initial calibration
    - analysis dated and time of ICV standard
    - file number of the ICV analysis
    - instrument identifier
    - column identifier
    - compound names for all target compounds and surrogates
    - observed retention times for each target compound and surrogate
    - initial calibration average RRF or CF or true concentration for each target compound and surrogate
    - observed ICV standard RRF or CF or concentration for each target compound and surrogate
    - percent difference or percent drift for each target compound and surrogate
    - acceptance criteria for ICV standard

- Continuing Calibration Verification (CCV) Summary: The CCV summaries will be arranged in chronological order, by instrument, by column, and must include the following:

    - SDG number
    - start and end dates and times of associated initial calibration
    - analysis dated and time of CCV standard
    - file number of the CCV analysis
    - instrument identifier
    - column identifier

- compound names for all target compounds and surrogates
- observed retention times for each target compound and surrogate
- initial calibration average RRF or RF or true concentration for each target compound and surrogate
- observed CCV standard RRF or RF or concentration for each target compound and surrogate
- percent difference or percent drift for each target compound and surrogate

- Internal Standard Area and Retention Time Summary (if applicable): The internal standard summaries will be arranged in chronological order, by instrument, by column, and must include the following:
  - SDG number
  - CCV standard file number
  - CCV standard date and time of analysis
  - instrument identifier
  - column identifier
  - compound name for each internal standard
  - observed area and retention time for each internal standard in the reference standard
    - project samples and QC sample areas and retention times must be compared to the associated CCV standard
    - CCV standard areas and retention times must be compared to the midpoint standard of the associated initial calibration
  - upper acceptance limit for the area and retention time for each internal standard
  - lower acceptance limit for the area and retention time for each internal standard
  - observed area and retention time for each internal standards from the midpoint standard of the associated initial calibration

- each associated BP sample number
- observed area and retention time for each internal standard for associated BP sample
- identifier for each associated QC sample
- observed area and retention time for each internal standard for associated QC sample

B. Sample Data

Sample data shall be arranged in individual sample packets (consisting of the Target Compound Analytical Results Summaries followed by the raw data for herbicide samples) that must be placed in increasing alphanumeric order by laboratory sample number. The order of each sample packet is as follows:

- Target Compound Analytical Results Summary that must include the following:
  - SDG number
  - BP sample number
  - laboratory sample identifier
  - matrix of the BP sample
  - date of sample collection
  - date of sample extraction
  - date of sample analysis
  - analysis file number
  - sample with or volume used for extraction with units
  - sample percent solids
  - sample final extract volume with units
  - sample extract injection volume with units
  - dilution factor

- indication if and what type of sample cleanup was performed
- name and CAS number for each target compound
- concentration of positives and PRQL and/or MDL for each target compound
- any applicable flags for target compound results (*e.g.*, "U" to designate a "not-detected" result)
- concentration units

- Copies of herbicide chromatograms
- Copies of herbicide chromatograms from second GC column confirmation (if performed)
- GC integration reports or data system printouts (including initial and re-integrations for manually-integrated data). All peaks must be included on the integration reports or data system printouts.
- RPD between concentrations on columns for positive results.
- Manual work sheets (including example calculation showing how sample results are calculated using initial calibration standard peak areas/heights and sample peak areas/heights for at least one sample)
- UV traces from GPC (if performed)
- If herbicides are confirmed by GC/MS, the laboratory must submit copies of raw spectra and copies of background-subtracted mass spectra of target compounds that are identified in the sample and corresponding background-subtracted target compound standard mass spectra.

C. Standards Data

- Analytical Sequence Form: The analytical sequence forms will be arranged in chronological order, by column, by instrument and must include the following:
  - SDG number
  - instrument identifier
  - column identifier

- BP sample numbers associated in the sequence
- QC sample identifiers associated in the sequence

- analysis file number, date, and time for each BP sample and QC sample associated in the sequence

- initial calibration start and end dates and times associated in the sequence

- Copies of chromatogram and integration report (including initial and re-integrations for manually-integrated data) for each initial calibration standard associated with SDG in chronological order, by GC column, by instrument

- Copies of chromatogram and integration report (including initial and re-integrations for manually-integrated data) for each initial calibration verification standard associated with SDG in chronological order, by GC column, by instrument following the associated initial calibration standards data

- Copies of chromatogram and integration report (including initial and re-integrations for manually-integrated data) for each continuing calibration standard associated with SDG in chronological order, by GC column, by instrument following the associated initial calibration standards data

D. Raw QC Data

- Blank Data (including instrument/solvent blank data) arranged in chronological order, by instrument

    - Target Compound Analytical Results Summary (as previously defined)

    - chromatograms and integration reports (including initial and re-integrations for manually-integrated data). All peaks must be included on the integration reports or data system printouts.

- LCS Data

    - Target Compound Analytical Results Summary (as previously defined)

    - chromatograms and integration reports (including initial and re-integrations for manually-integrated data)

- LCSD Data (if performed)

    - Target Compound Analytical Results Summary (as previously defined)

    - chromatograms and integration reports (including initial and re-integrations for manually-integrated data)

- MS Data

    - Target Compound Analytical Results Summary (as previously defined)

    - chromatograms and integration reports (including initial and re-integrations for manually-integrated data)

- MSD Data

    - Target Compound Analytical Results Summary (as previously defined)

    - chromatograms and integration reports (including initial and re-integrations for manually-integrated data)

E. Preparation Logs

- TCLP or SPLP Extraction Logs (if performed)

- Herbicide Extractions Logs

2.6 HPLC PAH/Explosive Results and QC

A. QC Summary

- Surrogate Percent Recovery Summary, which must include the following:

    - SDG number

    - BP sample number

    - Method blank sample number

    - MS sample number

    - MSD sample number

- LCS identifier
- LCSD identification number (if performed)
- matrix of the summarized samples
- percent recovery for all surrogate compounds from each column/detector
- applicable recovery limit for each surrogate compound

- MS/MSD Summary that must include the following:
  - SDG number
  - matrix of the summarized samples
  - BP sample number of the non-spiked aliquot
  - names of the compounds included in the MS solution
  - true concentrations and concentration units for each compound in the MS and MSD
  - observed compound concentration and concentration units in the non-spiked aliquot
  - observed compound concentration and concentration units in the MS aliquot
  - observed compound concentration and concentration units in the MSD aliquot
  - percent recovery for each compound
  - RPD between the MS/MSD results
  - recovery limits for each compound
  - RPD limit for each compound
- LCS Summary that must include the following:
  - SDG number
  - LCS matrix

- LCS identifier
- LCS solution lot number
- names of the compounds included in the LCS solution
- true concentration and concentration units for each compound in the LCS
- observed compound concentration and concentration units
- percent recovery for each compound
- recovery limits for each compound

If LCSD is performed, the summary must also include:

- LCSD identifier
- observed concentration for each LCSD compound
- percent recovery for each compound
- RPD between LCS/LCSD results
- RPD limit for each compound

- Method Blank Summary: The Method Blank Summaries will be arranged in chronological order by date of analysis of the blank, by instrument, by column, by detector, and must include the following:
  - SDG number
  - matrix of summarized samples
  - method blank identifier
  - analysis file number for the method blank
  - date and time of method blank analysis
  - instrument identifier
  - column/detector identification
  - BP sample numbers associated with the method blank

- analysis file number for each associated BP sample.
- indication if and what type of sample clean-up was performed.

- Initial Calibration RRF or RF Summary: The initial calibration RRF or CF summaries will be arranged in chronological order, by instrument, by column, by detector, and must include the following:

  - SDG number
  - start and end dates and times of the initial calibration
  - file identifiers for all initial calibration analyses
  - instrument identifier
  - column/detector identifier
  - compound names for all target compounds and surrogates
  - RRFs or RFs for each initial calibration standard performed
  - average RRF or RF for each target compound and surrogate
  - %RSD for each target compound and surrogate
  - calibration curve equation and curve plot for each target compound and surrogate (if applicable)

- Initial Calibration Retention Time Summary: The initial calibration retention time summaries will be arranged in chronological order, by instrument, by column, by detector, and must include the following:

  - SDG number
  - start and end dates and times of the initial calibration
  - file identifiers for all initial calibration analyses
  - instrument identifier
  - column/detector identifier
  - compound names for all target compounds and surrogates
  - retention times for each initial calibration standard performed

- average retention time for each target compound and surrogate
- upper and lower retention time acceptance limits for each target compound and surrogate

- Initial Calibration Verification (ICV) or Second Source Calibration Summary (if applicable): The ICV or Second Source Calibration Summary summaries will be arranged in chronological order, by instrument, by column, by detector, and must include the following:
  - SDG number
  - start and end dates and times of associated initial calibration
  - analysis dated and time of ICV or second source standard
  - file number of the ICV or second source analysis
  - instrument identifier
  - column/detector identifier
  - compound names for all target compounds and surrogates
  - observed retention times for each target compound and surrogate
  - initial calibration average RRF or RF or true concentration for each target compound and surrogate
  - observed ICV or second source standard RRF or RF or concentration for each target compound and surrogate
  - percent difference or percent drift for each target compound and surrogate
  - acceptance criteria for ICV or second source standard

- Continuing Calibration Verification (CCV) Summary: The CCV summaries will be arranged in chronological order, by instrument, by column, by detector, and must include the following:
  - SDG number
  - start and end dates and times of associated initial calibration
  - analysis dated and time of CCV standard

- file number of the CCV analysis
- instrument identifier
- column/detector identifier
- compound names for all target compounds and surrogates
- observed retention times for each target compound and surrogate
- initial calibration average RRF or RF or true concentration for each target compound and surrogate
- observed CCV standard RRF or RF or concentration for each target compound and surrogate
- percent difference or percent drift for each target compound and surrogate

- Internal Standard Area and Retention Time Summary (if applicable): The internal standard summaries will be arranged in chronological order, by instrument, by column, by detector, and must include the following:
  - SDG number
  - CCV standard file number
  - CCV standard date and time of analysis
  - instrument identifier
  - column/detector identifier
  - compound name for each internal standard
  - observed area and retention time for each internal standard in the reference standard
    - project samples and QC sample areas and retention times must be compared to the associated CCV standard
    - CCV standard areas and retention times must be compared to the midpoint standard of the associated initial calibration

- upper acceptance limit for the area and retention time for each internal standard
- lower acceptance limit for the area and retention time for each internal standard
- observed area and retention time for each internal standards from the midpoint standard of the associated initial calibration
- each associated BP sample number
- observed area and retention time for each internal standard for associated BP sample
- identifier for each associated QC sample
- observed area and retention time for each internal standard for associated QC sample

B. Sample Data

Sample data shall be arranged in individual sample packets (consisting of the Target Compound Analytical Results Summaries followed by the raw data for PAH/Explosive samples) that must be placed in increasing alphanumeric order by laboratory sample number. The order of each sample packet is as follows:

- Target Compound Analytical Results Summary that must include the following:
  - SDG number
  - BP sample number
  - laboratory sample identifier
  - matrix of the BP sample
  - date of sample collection
  - date of sample extraction
  - date of sample analysis
  - analysis file number
  - sample with or volume used for extraction with units

- sample percent solids
- sample final extract volume with units
- sample extract injection volume with units
- dilution factor
- indication if silica gel or other cleanup was performed
- name and CAS number for each target compound
- concentration of positives and PRQL and/or MDL for each target compound
- any applicable flags for target compound results (*e.g.*, "U" to designate a "not-detected" result)
- concentration units

- Copies of PAH/Explosive chromatograms

- Copies of PAH/Explosive chromatograms from UV and fluorescence column confirmation (if performed)

- HPLC integration reports or data system printouts (including initial and re-integrations for manually-integrated data). All peaks must be included on the integration reports or data system printouts.

- Manual work sheets (including example calculation showing how sample results are calculated using initial calibration standard peak areas/heights and sample peak areas/heights for at least one sample)

- UV traces from silica gel cleanup (if performed)

C. Standards Data

- Analytical Sequence Form: The analytical sequence forms will be arranged in chronological order, by HPLC column (if more than one used), by instrument, by detector, and must include the following:
  - SDG number
  - instrument identifier

- column/detector identifier
- BP sample numbers associated with the sequence
- QC sample identifiers associated with the sequence
- analysis file number, date, and time for each BP sample and QC sample associated with the sequence
- initial calibration start and end dates and times associated with the sequence

- Copies of chromatogram and integration report (including initial and re-integrations for manually-integrated data) for each initial calibration standard associated with SDG in chronological order, by HPLC column (if more than one used), by instrument, by detector

- Copies of chromatogram and integration report (including initial and re-integrations for manually-integrated data) for each initial calibration verification standard associated with SDG in chronological order, by HPLC column (if more than one used), by instrument, by detector following the associated initial calibration standards data

- Copies of chromatogram and integration report (including initial and re-integrations for manually-integrated data) for each continuing calibration standard associated with SDG in chronological order, by HPLC column (if more than one used), by instrument, by detector following the associated initial calibration standards data

D. Raw QC Data

- Blank Data (including instrument/solvent blank data) arranged in chronological order, by instrument
  - Target Compound Analytical Results Summary (as previously defined)
  - chromatograms and integration reports (including initial and re-integrations for manually-integrated data). All peaks must be included on the integration reports or data system printouts.

- LCS Data
  - Target Compound Analytical Results Summary (as previously defined)

- chromatograms and integration reports (including initial and re-integrations for manually-integrated data)

- LCSD Data (if performed)

  - Target Compound Analytical Results Summary (as previously defined)

  - chromatograms and integration reports (including initial and re-integrations for manually-integrated data)

- MS Data

  - Target Compound Analytical Results Summary (as previously defined)

  - chromatograms and integration reports (including initial and re-integrations for manually-integrated data)

- MSD Data

  - Target Compound Analytical Results Summary (as previously defined)

  - chromatograms and integration reports (including initial and re-integrations for manually-integrated data)

E. Preparation Logs

- PAH/Explosive Extractions Logs

2.7 ICP, ICP/MS, and AA Metals Results and QC

A. Target Analyte Results Summaries: Target analyte results summaries are required for all samples and will be arranged in increasing alphanumeric order by BP sample number. The target analyte results summary must include the following:

- SDG Number

- BP sample number

- laboratory sample identifier

- matrix of the BP sample

- date of sample collection
- sample percent solids
- name and CAS number for each target analyte
- concentration of positives and project-required detection limit (PRDL) and/or MDL for each target analyte
- any applicable flags for target analyte results (*e.g.*, "U" to designate a "not-detected" result)
- concentration units

B. QC and Quarterly Verification of Instrument Parameters Summaries

- Initial and Continuing Calibration Verification Summary: The initial and continuing calibration verification summaries will be arranged in chronological order, by instrument and must include the following:
  - SDG number
  - names for all target analytes
  - instrument identifier
  - start and end dates and times of the analytical sequence
  - true concentrations for all target analytes for the initial calibration verification (ICV) and continuing calibration verification (CCV) standards
  - observed concentrations for all target analytes for each ICV and CCV analyses
  - calculated percent recoveries for all target analytes for each ICV and CCV analyses
  - control limits for ICV and CCV percent recoveries
  - concentration units
- Reporting Limit (RL) Standard Summary: The RL standard summaries will be arranged in chronological order, by instrument and must include the following:

- SDG number
- names for all target analytes
- instrument identifier
- dates and times for the RL standard analyses
- true concentrations for all target analytes
- observed concentrations for all target analytes for each RL standard analysis
- calculated percent recoveries for all target analytes for each RL standard analysis
- control limits for RL standard recoveries
- concentration units

- Initial and Continuing Calibration Blank Summary: The initial and continuing calibration blank summaries will be arranged in chronological order, by instrument and must include the following:
  - SDG number
  - names for all target analytes
  - instrument identifier
  - start and end dates and times of the analytical sequence
  - observed concentration or MDL for each target analyte for each initial calibration blank (ICB) or continuing calibration blank (CCB) analysis
  - acceptance limits for ICB and CCB analyses
  - concentration units

- Preparation Blank Analytical Summary: The preparation blank analytical summaries will be arranged in chronological order, by instrument and must include the information presented in Section 2.7A.

- ICP and/or ICP/MS Interference Check Sample Summary: The ICP and/or ICP/MS interference check sample summaries will be arranged in chronological order, by instrument and must include the following: [NOTE: Aluminum, Calcium, Iron, and Magnesium results are to be reported even if these are not target analytes.]

    - SDG number
    - names for all target analytes
    - instrument identifier
    - dates and times for the ICP interference check standard analyses
    - true concentrations for all target analytes
    - observed concentrations for all target analytes observed in each ICP interference check standard analysis
    - calculated percent recoveries for all target analytes for each ICP interference check standard analysis
    - control limits for ICP interference check standard recoveries
    - concentration units

- MS Sample Recovery Summary: The MS sample recovery summaries will be arranged in alphanumeric order by laboratory sample number and must include the following:

    - SDG number
    - BP sample number for the spiked sample
    - percent solids for the BP sample
    - names for all target analytes
    - analyte concentration observed in the non-spiked sample aliquot
    - true concentrations for all target analytes in the MS solution
    - observed concentrations for all target analytes in the MS sample analysis
    - calculated percent recoveries for all target analytes

- control limits for MS sample recoveries
- concentration units

If an MSD is performed, the summary must also include:

- MSD identifier
- observed concentration for each all target analytes in the MSD sample
- percent recovery for all target analytes
- RPD between the MS/MSD results for each analyte
- RPD limit for each analyte

- Post-Spike Sample Recovery Summary (if applicable): The post-spike sample recovery summaries will be arranged in alphanumeric order by laboratory sample number and must include the following:
  - SDG number
  - BP sample number for the post-spiked sample
  - percent solids for the BP sample
  - names for all target analytes
  - analyte concentration observed in the non-spiked sample aliquot
  - true concentrations for all target analytes in the post-spike solution
  - observed concentrations for all target analytes in the post-spike sample analysis
  - calculated percent recoveries for all target analytes
  - control limits for post-spike sample recoveries
  - concentration units

- Duplicates Precision Summary: The duplicate precision summaries will be arranged in alphanumerical order by BP sample number and must include the following:

    - SDG number
    - BP sample number for the duplicate sample
    - percent solids for the BP sample
    - names for all target analytes
    - analyte concentration observed in the original sample aliquot
    - observed concentrations for all target analytes in the duplicate sample analysis
    - calculated RPD for all target analytes
    - control limits for RPD
    - concentration units

- LCS Recovery Summary: The LCS recovery summaries will be arranged in chronological order, by instrument and must include the following:

    - SDG number
    - LCS identifier
    - names for all target analytes
    - true concentrations for all target analytes in the LCS solution
    - observed concentrations for all target analytes in the LCS analysis
    - calculated percent recoveries for all target analytes
    - control limits for LCS recoveries
    - concentration units

- Standard Addition Results Summary that must include the following:

    - SDG number

- BP sample number for the sample that underwent the standard additions procedure
- names for all target analytes
- analyte concentration or absorbance observed in the non-spiked sample aliquot
- true concentrations for all target analytes for each standard addition analysis
- observed concentration or absorbance for each standard addition analysis
- calculated concentration for each target analyte
- calculated correlation coefficient for each target analyte
- concentration units

- ICP and/or ICP/MS Serial Dilution Summary: The ICP and/or ICP/MS serial dilution summaries will be arranged in alphanumeric order by laboratory sample number and must include the following:
  - SDG number
  - BP sample number for the ICP or ICP/MS serial dilution sample
  - names for all target analytes
  - analyte concentration observed in the original sample aliquot
  - observed concentrations for all target analytes in the ICP or ICP/MS serial dilution analysis
  - calculated percent difference for all target analytes
  - control limits for percent difference
  - concentration units
- RL and Method Detection Limit (MDL) Summary: The RL and MDL summaries will be arranged in chronological order, by instrument and must include the following:
  - SDG number

- instrument identifier
- date the MDL determination was performed
- names for all target analytes
- determined MDL for all target analytes
- RL for all target analytes
- concentration units

- ICP Interelement Correction Factors Summary: The ICP interelement correction factors summaries will be arranged in chronological order, by instrument and must include the following:
  - SDG number
  - instrument identifier
  - date the ICP interelement correction factors determination was performed
  - names for all target analytes
  - determined ICP interelement correction factors concentrations for all target analytes
  - concentration units

- ICP and/or ICP/MS Linear Range Summary: The ICP and/or ICP/MS linear range summaries will be arranged in chronological order, by instrument and must include the following:
  - SDG number
  - instrument identifier
  - date the ICP linear range determination was performed
  - names for all target analytes
  - determined ICP linear range concentrations for all target analytes
  - concentration units

- TCLP or SPLP Preparation Logs (if performed)

- BP sample and QC sample preparation logs

- Analytical Sequence Form: The analytical sequence forms will be arranged in chronological order, by analyte, by instrument and must include the following:

    - SDG number

    - instrument identifier
    - BP sample numbers associated with the sequence

    - QC sample identifiers associated with the sequence

    - analysis date and time for each BP sample and QC sample associated with the sequence

    - identification of all target analytes reported from each BP sample and QC sample analysis

    - dilution factor for each BP sample and QC sample analysis

    - start and end dates and times for the sequence

- ICP/MS Data Packages will include the following forms in addition to the requirements listed above.

    - ICP/MS Tune Summary

    - ICP/MS Internal Standards Relative Intensity Summary [the summary must include the acceptance limits and reference internal standards intensity.]

C. Raw Data

For each reported value, the laboratory will provide all raw data used to obtain that value; this requirement applies to all required QA/QC measurements and instrument standardization as well as all sample analysis results. This statement does not apply to the Quarterly Verifications Parameters submitted as part of each data package. Raw data must contain all instrument readouts used for the sample results. Each exposure or instrumental reading must be provided, including those readouts that may fall below the RL but greater than the MDL. All ICP, ICP/MS, and AA instruments must provide a legible hardcopy of the direct real-time instrument readout (*e.g.*, strip-charts, printer tapes, *etc.*). A photocopy of the instrument's direct sequential readout must be included. A

hardcopy of the instrument's direct instrument readout for cyanide must be included if the instrumentation has the capability.

2.8 General Chemistry Results and QC

The general chemistry data will be arranged in the following order by individual parameter requested for the samples in the SDG.

A. Target Analyte Results Summaries: Target analyte results summaries are required for all samples and will be arranged in increasing alphanumeric order by BP sample number. The target analyte results summary must include the following:

- SDG Number
- BP sample number
- laboratory sample identifier
- matrix of the BP sample
- date of sample collection
- sample percent solids
- name and CAS number for each target analyte
- concentration of positives and PRDL and/or MDL for each target analyte
- any applicable flags for target analyte results (*e.g.*, "U" to designate a "not-detected" result)
- concentration units

B. QC Summaries

- Initial and Continuing Calibration Verification Summary: The initial and continuing calibration verification summaries will be arranged in chronological order, by instrument and must include the following:

  - SDG number
  - names for all target analytes
  - instrument identifier

- start and end dates and times of the analytical sequence
- true concentrations for all target analytes for the ICV and CCV standards
- observed concentrations for all target analytes for each ICV and CCV analyses
- calculated percent recoveries for all target analytes for each ICV and CCV analyses
- control limits for ICV and CCV percent recoveries
- concentration units

- Initial and Continuing Calibration Blank Summary: The initial and continuing calibration blank summaries will be arranged in chronological order, by instrument and must include the following:
  - SDG number
  - names for all target analytes
  - instrument identifier
  - start and end dates and times of the analytical sequence
  - observed concentration or MDL for each target analyte for each ICB or CCB analysis
  - acceptance limits for ICB and CCB analyses
  - concentration units
- Preparation Blank Analytical Summary: The preparation blank analytical summaries will be arranged in chronological order, by instrument and must include the information presented in Section 2.8a.
- MS Sample Recovery Summary: The spike sample recovery summaries will be arranged in alphanumeric order by laboratory sample number and must include the following:
  - SDG number
  - BP sample number for the spiked sample
  - percent solids for the BP sample

- names for all target analytes
- analyte concentration observed in the non-spiked sample aliquot
- true concentrations for all target analytes in the spike solution
- observed concentrations for all target analytes in the spike sample analysis
- calculated percent recoveries for all target analytes
- control limits for spike sample recoveries
- concentration units

If an MSD is performed, the summary must also include:

- MSD identifier
- observed concentration for each all target analytes in the MSD sample
- percent recovery for all target analytes
- RPD between the MS/MSD results for each analyte
- RPD limit for each analyte

- Duplicates Precision Summary: The duplicate precision summaries will be arranged in alphanumeric order by laboratory sample number and must include the following:
  - SDG number
  - BP sample number for the duplicate sample
  - percent solids for the BP sample
  - names for all target analytes
  - analyte concentration observed in the original sample aliquot
  - observed concentrations for all target analytes in the duplicate sample analysis

- calculated RPD for all target analytes
- control limits for RPD
- concentration units

- LCS Recovery Summary: The LCS recovery summaries will be arranged in chronological order, by instrument and must include the following:
  - SDG number
  - LCS identifier
  - names for all target analytes
  - true concentrations for all target analytes in the LCS solution
  - observed concentrations for all target analytes in the LCS analysis
  - calculated percent recoveries for all target analytes
  - control limits for LCS recoveries
  - concentration units

- Analytical Sequence Form: The analytical sequence forms will be arranged in chronological order, by analyte, by instrument and must include the following:
  - SDG number
  - instrument identifier
  - identification of the target analyte
  - BP sample numbers associated with the sequence
  - QC sample identifiers associated with the sequence
  - analysis date and time for each BP sample and QC sample associated with the sequence
  - start and end dates and times for the sequence

C. Raw Data

For each reported value, the laboratory will provide all raw data (instrument printouts or logbook pages) used to obtain that value; this requirement applies to all required QA/QC measurements and instrument standardization, as well as all sample analysis results. Raw data must contain all instrument readouts/logbooks pages used for the sample results. Each exposure or instrumental reading must be provided, including those readouts/logbook pages that may fall below the quantitation limit. A photocopy of the instrument's direct sequential readout must be included if the instrumentation has the capability.

D. General Chemistry Preparation Logs (by parameter)

2.9. Radiological Data

The radiological data will be arranged in the following order by individual parameter requested for the samples in the SDG.

A. Target Analyte Results Summaries: Target analyte results summaries are required for all samples and will be arranged in increasing alphanumeric order by BP sample number. The target analyte results summary must include the following:

- SDG Number
- BP sample number
- laboratory sample identifier
- matrix of the BP sample
- date of sample collection
- date of sample analysis
- sample activity, uncertainty, and the sample-specific minimum detectable concentration (MDC). The sample-specific MDC will be based on the background of the detector that the sample was counted on. The sample activity (positive or negative), uncertainty, and sample-specific MDC will be reported for positive and "not-detected" results
- any applicable flags for target analyte results (e.g., "U" to designate a "not-detected" result)
- concentration units

B. Quality Control Summaries

- Chemical Yield (Tracer/Carrier) Recovery Summary that must include the following:
  - SDG number
  - BP sample number
  - Method blank sample number
  - MS sample number

- MSD sample number
- LCS identification number
- LCSD identification number (if performed)
- percent recovery for all tracers/carriers
- applicable recovery limits for each tracer/carrier

- Method Blank Summary: The method blank summaries will be arranged in chronological order, by instrument and method and must include the following:
  - SDG number
  - names for all target analytes
  - observed activity, uncertainty, and MDC for each target analyte for each method blank analysis
  - concentration units

- MS Sample Recovery Summary: The MS sample recovery summaries will be arranged by instrument and method and must include the following:
  - SDG number
  - BP sample number for the spiked sample
  - names for all target analytes
  - analyte concentration observed in the non-spiked sample aliquot
  - true concentrations for all target analytes in the MS solution
  - observed concentrations for all target analytes in the MS sample analysis
  - calculated percent recoveries for all target analytes
  - control limits for MS sample recoveries
  - concentration units

If an MSD is performed, the summary must also include:

- MSD identifier
- observed concentration for each all target analytes in the MSD sample
- percent recovery for all target analytes
- RPD/RER between the MS/MSD results for each analyte
- RPD/RER limit for each analyte

- Duplicates Precision Summary: The duplicate precision summaries will be arranged by instrument and method and must include the following:

  - SDG number
  - BP sample number for the duplicate sample
  - names for all target analytes
  - analyte activity, uncertainty, and MDC observed in the original sample aliquot
  - observed activity, uncertainty, and MDC for all target analytes in the duplicate sample analysis
  - calculated RPD/Replicate Error Ratio (RER) for all target analytes
  - control limits for RPD/RER
  - concentration units

- LCS Recovery Summary: The LCS recovery summaries will be arranged by instrument and method and must include the following:

  - SDG number
  - LCS identifier
  - names for all target analytes
  - true concentrations for all target analytes in the LCS solution
  - observed concentrations for all target analytes in the LCS analysis

- calculated percent recoveries for all target analytes

- control limits for LCS recoveries
- concentration units

- Calibration Verification Summary: The calibration verification summaries will be arranged by instrument and method and must include the following:

  - SDG number

  - names for all target analytes

  - instrument identifier

  - date the calibration verification was performed. For each method and analyte, the Contracted Laboratories will provide Calibration Verification summaries that include or bracket the analysis dates of the field and QC samples.

  - acceptance limits for the calibration verification

  - the following calibration verification summaries will be provided for Gas Flow Proportional Counter data

    a. Efficiency Checks
    b. Background Checks

  - the following calibration verification summaries will be provided for Alpha Spectroscopy data

    a. Energy Calibration Checks
    b. Efficiency Checks
    c. Background Checks (
    d. Resolution (FWHM) Checks

  - the following calibration verification summaries will be provided for Alpha Scintillation data

    a. Daily Instrument Performance Checks
    b. Background Checks

C. Raw Data

For each reported value, the Contracted Laboratories will provide all raw data (instrument printouts) used to obtain that value. This applies to all required QA/QC measurements (including tracer/carrier recoveries) as well as all sample analysis results. Raw data must contain all instrument readouts and worksheets used for the sample results. An exhibit work sheet per method (including example calculations showing how sample activity, TPU and MDA are calculated) will be provided.

D. Preparation Logs (by method)

E. Traceability Documents (by method)

3.0 General Format for Limited Data Package Deliverables

Limited Data Package Deliverables will contain data for all samples in one SDG. All Limited Data Packages will be arranged in the following order:

3.1 Documentation

- Cover Letter/Letter of Transmittal signed by Technical Project Manager or designee
- SDG Narrative signed by Technical Project Manager or designee [The SDG Narrative must include a statement or statements relative to compliance with this document and any applicable QAPP or WP and description of any deviations.]
- References to preparation and analytical methods performed and applicable project documents (i.e., QAPP)
- Field and Internal Laboratory Chain-of-Custody Records
- Sample Receipt Information
- Project Correspondence

3.2 Results and QC

- GC/MS Volatile Data (analytical results summaries for all samples, method blanks, matrix spike [MS] samples, MS duplicate [MSD] samples, laboratory control samples [LCSs], and LCS duplicates [LCSDs]; MS/MSD recovery and precision summaries; LCS/LCSD recovery and precision summaries; surrogate percent recovery summary; and method blank summaries [summaries defined in Section 2.1]).

- GC Volatile Data (analytical results summaries for all samples, method blanks, MS samples, MSD samples, LCSs, and LCSDs; MS/MSD recovery and precision summaries; LCS /LCSD recovery and precision summaries; surrogate percent recovery summary; and method blank summaries [summaries defined in Section 2.2]).
- GC/MS Semivolatile Data (analytical results summaries for all samples, method blanks, MS samples, MSD samples, LCSs, and LCSDs; MS/MSD recovery and precision summaries; LCS /LCSD recovery and precision summaries; surrogate percent recovery summary; and method blank summaries [summaries defined in Section 2.3]).

- GC Organochlorine Pesticide/PCB Data (analytical results summaries for all samples, method blanks, MS samples, MSD samples, LCSs, and LCSDs; MS/MSD recovery and precision summaries; LCS /LCSD recovery and precision summaries; surrogate percent recovery summary; and method blank summaries [summaries defined in Section 2.4]).

- GC Herbicide Data (analytical results summaries for all samples, method blanks, MS samples, MSD samples, LCSs, and LCSDs; MS/MSD recovery and precision summaries; LCS /LCSD recovery and precision summaries; surrogate percent recovery summary; and method blank summaries [summaries defined in Section 2.5]).

- HPLC PAH/Explosive Data (analytical results summaries for all samples, method blanks, MS samples, MSD samples, LCSs, and LCSDs; MS/MSD recovery and precision summaries; LCS /LCSD recovery and precision summaries; surrogate percent recovery summary; and method blank summaries [summaries defined in Section 2.6]).

- ICP, ICP/MS, and AA Metals Data (analytical results summaries for all samples and preparation blanks; MS/MSD recovery and precision summaries; post-digestion MS recovery summaries; laboratory duplicate precision summaries; LCS recovery summaries; and preparation logs [summaries defined in Section 2.7]).

- General Chemistry Data (by parameter: analytical results summaries for all samples and preparation blanks; MS/MSD recovery and precision summaries; laboratory duplicate precision summaries; LCS recovery summaries; and preparation logs [summaries defined in Section 2.8]).

- Radiological Data (analytical results summaries for all samples and preparation blanks; MS/MSD recovery and precision summaries; laboratory duplicate precision summaries; LCS recovery summaries; and chemical yield [tracer/carrier] recovery summaries [summaries defined in Full Deliverables Section 2.9]).

APPENDIX D

REQUIREMENTS FOR RADIOLOGICAL ANALYSES

Table D-1 Gas Flow Proportional Counting System Quality Control Requirements			
Quality Control Item	**Frequency**	**Acceptance Criteria**	**Corrective Action**
Self-Absorption Curves & Cross-Talk Curves (for gross α and gross β)	Annually. Same matrix and geometry as samples.	Not applicable.	Not applicable..
Efficiency Checks	Daily when detector is utilized.	Less than ±2σ limits or within ±2σ and ±3σ limits.	Less than ±2σ limits–no action. Between 2σ and 3σ –investigate, note warning. Greater than 3σ–detector must not be used; take corrective action.
Background Checks	Daily when detector is utilized.	Less than ±2σ limits or within ±2σ and ±3σ limits.	Less than ±2σ limits–no action. Between 2σ and 3σ –investigate, note warning. Greater than 3σ–detector must not be used; take corrective action.
Method Blank	One per batch of 20 or fewer samples per matrix per day. Must undergo all sample preparative procedures. Do not subtract blank from field and QC samples.	All target analytes <reporting limit.	Recount once (along with all associated samples) to determine if instrument contamination was the cause. If the method blank is still noncompliant, reprepare and reanalyze a new method blank and all associated samples. Exception: If there are no positive results (activity <MDC) in the associated samples, no further action needed.

Table D-1 Gas Flow Proportional Counting System Quality Control Requirements - Continued			
Quality Control Item	**Frequency**	**Acceptance Criteria**	**Corrective Action**
Laboratory Control Sample (LCS)*	One per batch of 20 or fewer samples per matrix per day. Must undergo all sample preparative procedures.	Aqueous: 80-120% Soil and Air: 75-125%	Recount once (along with all associated samples) to determine if instrumental conditions or analytical preparation was the cause. If the LCS is still noncompliant, reprepare and reanalyze a new LCS and all associated samples. Exception: If the LCS recovery is high and there are no positive results (activity <MDC) in the associated samples, then address in SDG Narrative; no further action needed.
Matrix Spike (if applicable)*	One per batch of 20 or fewer samples per matrix per day. Must undergo all sample preparative procedures.	Aqueous and Soil: 70-130%	If LCS is acceptable, then report in the SDG Narrative that there was probable matrix interference.
Laboratory or Matrix Duplicate (if applicable)*	One per batch of 20 or fewer samples per matrix per day. Must undergo all sample preparative procedures.	Aqueous and Soil: RER<2 Air: RER<3	If LCS is acceptable, then report in the SDG Narrative that there was probable matrix interference.

Table D-1 Gas Flow Proportional Counting System Quality Control Requirements - Continued			
Quality Control Item	**Frequency**	**Acceptance Criteria**	**Corrective Action**
Chemical Yield (Carrier/Tracer Recovery, if applicable)*	Added to all blanks, samples, and QC samples.	20-115%	If yield is not within limits: 1. Recount (or reweigh if yield is determined gravimetrically) once to determine if instrumental conditions or analytical preparation was the cause. 2. If yield still noncompliant, reprepare and reanalyze the sample.
Quantitative Issues		Sample density on the planchet area should be no more than 5 mg/cm^2 for alpha and no more than 10 mg/cm^2 for beta.	Reprepare samples using a smaller aliquot.

***** The limits presented for these QC analyses are laboratory-derived limits. These limits will periodically be updated; however, the updated limits are not expected to be significantly different than those herein. Laboratory corrective actions will be taken based on the current laboratory-derived limits.

Table D-2 Alpha Spectroscopy Quality Control Requirements			
Quality Control Item	**Frequency**	**Acceptance Criteria**	**Corrective Action**
Energy Calibration Check	Monthly.	Less than ±2σ limits or within ±2σ and ±3σ limits.	Less than ±2σ limits–no action. Between 2σ and 3σ –investigate, note warning. Greater than 3σ–detector must not be used; take corrective action.
Efficiency Check	Monthly.	Less than ±2σ limits or within ±2σ and ±3σ limits.	Less than ±2σ limits–no action. Between 2σ and 3σ –investigate, note warning. Greater than 3σ–detector must not be used; take corrective action.
Background Check	Weekly.	Less than ±2σ limits or within ±2σ and ±3σ limits.	Less than ±2σ limits–no action. Between 2σ and 3σ –investigate, note warning. Greater than 3σ–detector must not be used; take corrective action.
Resolution Check (FWHM)	Monthly.	Less than ±2σ limits or within ±2σ and ±3σ limits.	Less than ±2σ limits–no action. Between 2σ and 3σ –investigate, note warning. Greater than 3σ–detector must not be used; take corrective action.

Table D-2 Alpha Spectroscopy Quality Control Requirements - Continued			
Quality Control Item	**Frequency**	**Acceptance Criteria**	**Corrective Action**
Method Blank	One per batch of 20 or fewer samples per matrix per day. Must undergo all sample preparative procedures. Do not subtract blank from field and QC samples	Target analytes <reporting limit.	Recount once (along with all associated samples) to determine if instrument contamination was the cause. If the method blank is still noncompliant, reprepare and reanalyze a new method blank and all associated samples. Exception: If there are no positive results (activity <MDC) in the associated samples, no further action needed.
Laboratory Control Sample (LCS)*	One per batch of 20 or fewer samples per matrix per day. Must undergo all sample preparative procedures.	Aqueous: 80-120% Soil and Air: 75-125%	Recount once (along with all associated samples) to determine if instrumental conditions or analytical preparation was the cause. If the LCS is still noncompliant, reprepare and reanalyze a new LCS and all associated samples. Exception: If the LCS recovery is high and there are no positive results (activity <MDC) in the associated samples, then address in SDG Narrative; no further action needed.

Table D-2 Alpha Spectroscopy Quality Control Requirements - Continued			
Quality Control Item	**Frequency**	**Acceptance Criteria**	**Corrective Action**
Matrix Spike (if applicable)*	One per batch of 20 or fewer samples per matrix per day. Must undergo all sample preparative procedures.	Aqueous and Soil: 70-130%	If LCS is acceptable, then report in the SDG Narrative that there was probable matrix interference.
Laboratory or Matrix Duplicate (if applicable)*	One per batch of 20 or fewer samples per matrix per day. Must undergo all sample preparative procedures.	Aqueous and Soil: RER<2 Air: RER<3	If LCS is acceptable, then report in the SDG Narrative that there was probable matrix interference.
Chemical Yield (Tracer Recovery)*	Added to all blanks, samples, and QC samples.	20-115%	If yield is not within limits: 1. Recount once to determine if instrumental conditions or analytical preparation was the cause. 2. If yield still noncompliant, reprepare and reanalyze the sample.

***** The limits presented for these QC analyses are laboratory-derived limits. These limits will periodically be updated; however, the updated limits are not expected to be significantly different than those herein. Laboratory corrective actions will be taken based on the current laboratory-derived limits.

Table D-3 Alpha Scintillation Quality Control Requirements			
Quality Control Item	**Frequency**	**Acceptance Criteria**	**Corrective Action**
Instrument Performance Check (gross count of a known level)	Daily when detector is utilized.	Less than ±2σ limits or within ±2σ and ±3σ limits.	Less than ±2σ limits–no action. Between 2σ and 3σ –investigate, note warning. Greater than 3σ–detector must not be used; take corrective action.
Background Check	Daily when instrument is utilized.	Less than ±2σ limits or within ±2σ and ±3σ limits.	Less than ±2σ limits–no action. Between 2σ and 3σ –investigate, note warning. Greater than 3σ–detector must not be used; take corrective action.
Method Blank	One per batch of 20 or fewer samples per matrix per day. Must undergo all sample preparative procedures. Do not subtract blank from field and QC samples	Target analytes <reporting limit.	Recount once (along with all associated samples) to determine if instrument contamination was the cause. If the method blank is still noncompliant, reprepare and reanalyze a new method blank and all associated samples. Exception: If there are no positive results (activity <MDC) in the associated samples, no further action needed.

Table D-3 Alpha Scintillation Quality Control Requirements - Continued			
Quality Control Item	**Frequency**	**Acceptance Criteria**	**Corrective Action**
Laboratory Control Sample (LCS)*	One per batch of 20 or fewer samples per matrix per day. Must undergo all sample preparative procedures.	Aqueous: 80-120% Air: 75-125%	Recount once (along with all associated samples) to determine if instrumental conditions or analytical preparation was the cause. If the LCS is still noncompliant, reprepare and reanalyze a new LCS and all associated samples. Exception: If the LCS recovery is high and there are no positive results (activity <MDC) in the associated samples, then address in SDG Narrative; no further action needed.
Matrix Spike (if applicable)*	One per batch of 20 or fewer samples per matrix per day. Must undergo all sample preparative procedures.	Aqueous: 70-130%	If LCS is acceptable, then report in the SDG Narrative that there was probable matrix interference.
Laboratory or Matrix Duplicate (if applicable)*	One per batch of 20 or fewer samples per matrix per day. Must undergo all sample preparative procedures.	Aqueous: RER<2 Air: RER<3	If LCS is acceptable, then report in the SDG Narrative that there was probable matrix interference.
Chemical Yield (Carrier/Tracer Recovery, if applicable)*	Added to all blanks, samples, and QC samples.	20-115%	If yield is not within limits: 1. Recount once to determine if instrumental conditions or analytical preparation was the cause. 2. If yield still noncompliant, reprepare and reanalyze the sample.

* The limits presented for these QC analyses are laboratory-derived limits. These limits will periodically be updated; however, the updated limits are not expected to be significantly different than those herein. Laboratory corrective actions will be taken based on the current laboratory-derived limit

Note: Copied & renamed Rev. 00, 4/11/00. Accepted all revisions. Used as basis for GCLN Core Team Technical Requirements review on 5/18/00. (RJS 5/18/00)

9/11/00 Renamed to "Rev. 02-Final Draft", maintained previous revisions. Incorporated all revisions resulting from the 5/18-5/19/00 GCLN Core and Extended Team review meetings, and subsequent action item assignments. Issued for Final Comments. (RJS 9/11/00)

9/27/00 GCLN Technical Requirements, Rev 02-Final Draft, 9/27/00.doc includes Rock Vitale's, Dane Wren's, Mike Green's, and RJS's comments.

9/28/00 GCLN Technical Requirements, Rev 02-Final Draft, 9/28/00.doc includes Rock Vitale's, Dane Wren's, Mike Green's, and RJS's final comments, per 9/27/00 conference call. Ready for distribution to Labs for their final input and concurrence.

1/26/2001 GCLN Technical Requirements, Rev 02-Final Draft, 9/28/00.doc issued as "Final" with no changes. Pace comments received via e-mail on 10/28/2000, and STL's received via e-mail on 10/9/2000. No response received from FCL. File saved as C:\Documents and Settings\schneirj\My Documents\schneirj\D\GCLN\1999 RFP\Technical Requirements\GCLN Tech Rqmts, Rev 02-Final Draft, 9-28-00.doc with all revisions accepted.

4/10/2002 GCLN Technical Requirements, Revision 03 - Issued for RFP for Re-Bid GCLN Contract Labs

4/14/02 GCLN Technical Requirements, Revision 04- Draft Issued for RFP for Re-Bid GCLN based on Rock Vitale's suggested/recommended updates

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04/19/02 GCLN Technical Requirements, Revision 06- Draft Issued for RFP for Re-Bid GCLN based on based on the conference call with J. Plant, D. Wren. T Tunnicliff, M. Tait, M. Green and R. Vitale on April 17, 2002

04/24/02 GCLN Technical Requirements, Revision 07- issued for RFP 2002 for re-bids of GCLN Contract Laboratories

05/22/02 GCLN Technical Requirements, Revision 08- issued for RFP 2002 for re-bids of GCLN Contract Laboratories

07/30/07 LaMP Technical Requirements, Revision 09 Final – issued for RFP 2007 for re-bids of LaMP Contract Laboratories